INSTALLATION RESTORATION PROGRAM

FINAL
PRELIMINARY ASSESSMENT/SITE INSPECTION REPORT

110th FIGHTER WING
MICHIGAN AIR NATIONAL GUARD
W.K. KELLOGG REGIONAL AIRPORT
BATTLE CREEK, MICHIGAN

APRIL 1996

AIR NATIONAL GUARD

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
Environmental Restoration and Waste Management Programs
Oak Ridge, Tennessee 37831-7606
managed by LOCKHEED MARTIN ENERGY SYSTEMS, INC.
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Preliminary Assessment/ Site Inspection Report of Areas Of Concern (AOC) A thru F at WK Kellogg, Battle Creek, MI. A Preliminary Assessment/ Site Inspection was performed on 6 AOC's at WK Kellogg to confirm or deny the presence of contamination at the AOC's. The AOC's involved in this investigation include: AOC A, Waste Accumulation Area; AOC B, Motor Pool Drainage Ditch; AOC C, Fire Training Area South; AOC D, Fire Training Area West; AOC E, Old Hanger (Building 6900); AOC F, New Hanger (Building 6901). The recommendation is for AOC's A and B continue to the RI/FS stage.

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FINAL

PRELIMINARY ASSESSMENT/SITE INSPECTION REPORT

110TH FIGHTER WING, MICHIGAN AIR NATIONAL GUARD
W.K. KELLOGG REGIONAL AIRPORT
BATTLE CREEK, MICHIGAN

Submitted to:

AIR NATIONAL GUARD READINESS CENTER
ANDREWS AFB, MARYLAND

Submitted by:

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
Oak Ridge, Tennessee 37831

for the:

U.S. DEPARTMENT OF ENERGY

Prepared by:

EARTH TECH, Inc.
Oak Ridge, Tennessee 37830

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AMSL	above mean sea level
AOC	Area of Concern
ANG	Air National Guard
ANGRC	Air National Guard Readiness Center
ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CLP	Contract Laboratory Program
DCE	Dichloroethene
DD	Decision Document
DoD	Department of Defense
DOE	Department of Energy
EA	Environmental Assessment
EARTH TECH	The Earth Technology Corporation
EPA	Environmental Protection Agency
ES	Engineering-Science
FFS	Focused Feasibility Study
FG	Fighter Group
FIRM	Flood Insurance Rate Map
FR	Federal Register
FS	Feasibility Study
FTA	Fire Training Area
FW	Fighter Wing
GC	Gas Chromatograph
HAZWRAP	Hazardous Waste Remedial Actions Program
HMTC	Hazardous Materials Technical Center
IRP	Installation Restoration Program
LMES	Lockheed Martin Energy Systems

MCL	Maximum Contaminant Level
MDL	method detection limit
MDNR	Michigan Department
MDOT	Michigan Department of Transportation
MERA	Michigan Environmental Response Act
MIANG	Michigan Air National Guard
NCP	National Contingency Plan
NREPA	National Resources and Environmental Protection Act
OWS	Oil/Water Separator
PA	Preliminary Assessment
PAH	polynuclear aromatic hydrocarbons
PA/SI	Preliminary Assessment/Site Investigation
PCBs	Polychlorinated Biphenyls
PCE	tetrachlorethene
PD-680	Petroleum Distillate - 680
PID	Photoionization Detector
POL	Petroleum, oil, and lubricants
PP	Priority Pollutant
PVC	polyvinyl chloride
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SI	Site Inspection
SOV	Soil Organic Vapor
SVOCs	Semivolatile Organic Compounds
TCA	Trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TICs	tentatively identified compounds
TPH	Total Petroleum Hydrocarbons
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOA	Volatile Organic Analyte
VOCs	Volatile Organic Compounds
WMD	Waste Management Division

EXECUTIVE SUMMARY

This Preliminary Assessment (PA)/Site Inspection (SI) Report documents activities The Earth Technology Corporation performed at the 110th Fighter Wing, Michigan Air National Guard (MIANG), W.K. Kellogg Regional Airport, Battle Creek, Michigan under the U.S. Department of Defense Installation Restoration Program. The base encompasses 315 acres of land in southwestern Battle Creek, Michigan. The property was established and used by the Army Air Corps from 1942 to 1946. The MIANG has occupied the property from 1946 to the present. In 1992, the 110th Fighter Wing, MIANG, was assigned the A-10 aircraft which it currently operates.

Activities completed during the PA included interviews with 28 active or retired MIANG personnel and a records review (base operations and outside state and county agencies). These dat a were used to describe past waste handling and disposal practices on base and identify areas of environmental concern (AOC). Six AOC (numbered A through F). Sampling strategies (focusing on surface and subsurface soils) were developed, incorporated into the PA/SI Work Plan (March 1994) and implemented during July and November 1994.

Preliminary Assessment

Several base operations have used, or currently use, potentially hazardous or toxic materials. Since 1985, these materials have been collected and removed from the base by the Defense Reutilization and Marketing Organization. Prior to 1985, much of the liquid waste generated by the various shops located on the base was collected and used during fire training exercises. One location within the vehicle refueling area (subsequently identified as AOC A) was used as a temporary collection point for these wastes. Smaller amounts of wastes generated in the hangars were reportedly placed in the dumpsters located at Building 6900 or poured on the ground. The data collected during the PA identified six AOCs where sampling activities were initiated to confirm or deny the presence of contamination. These AOCs are:

AOC A: Waste Accumulation Area - Prior to 1980, this facility was used as a waste petroleum, oil, and lubricants (POL) and solvent collection and storage area. An estimated 20

to 100 gallons of waste accumulated in this area per month. Spillage was estimated to be less than 5 gallons/month.

AOC B: Motor Pool Drainage Ditch - This area received runoff from the motor pool and areas adjoining the motor pool and directed these surface waters to the drainage swale (IRP Site 2) from 1963 to the present.

AOC C: Fire Training Area (FTA) - South - A former FTA, consisting of two separate bermed areas, was located on airport property immediately south of the base. These FTAs were used from approximately 1965 to 1967. An estimated total of 5,400 to 7,200 gallons of fuels and/or solvents were used at AOC C.

AOC D: Fire Training Area - West - This FTA was used once in 1978 to burn a damaged aircraft prior to its being shipped off-base for disposal. The area is located within the boundaries of IRP Site 5. An estimated total of 1,800 to 2,400 gallons of fuels and/or solvents were used at AOC D.

AOC E: Old Hangar (Building 6900) - Prior to construction of the new hangar (1962) aircraft maintenance activities were housed in the old hangar (Building 6901). After 1962, the old hangar was used for vehicle maintenance and aircraft parts painting operations. A grassy area existing between the hangar and the apron was suspected of being an area where small amounts of shop wastes were disposed of.

AOC F: New Hangar (Building 6901) - The new hangar (Building 6900) has housed aircraft maintenance operations since the facility was constructed in 1962. Small quantities of used solvent, and waste paint and POL were disposed of in the dumpsters. The dumpsters reportedly leaked and stained soils were reported beneath the dumpsters.

Site Inspection Results

Under Part 201 of the Michigan Natural Resources and Environmental Protection Act (NREPA) of 1994, PA451, interim, generic residential, commercial and industrial chemical-specific

cleanup criteria exist for soils and groundwater. Soil analytical results obtained during the SI were compared to the generic industrial direct contact values and the residential 20 times groundwater values to evaluate their potential impacts on human health and the groundwater beneath the facility. Groundwater analytical results were compared to the residential cleanup criteria. Site-specific background metals concentrations were developed during the Remedial Investigation (EARTH TECH, June 1995) and have been incorporated into this evaluation. The results, conclusions, and recommendations obtained from the sampling are included in the following discussions.

AOC A: Waste Accumulation Area - SI soil analytical results contained hydrocarbons, primarily SVOCs, and metals which were associated with these hydrocarbons. These results support the reports from base personnel that past spills of waste POL/solvents have occurred at AOC A. No compounds were detected in the soils in concentrations which exceed generic industrial direct contact values. Surface and subsurface soil analytical results show methylene chloride (subsurface soils) and phenanthrene (surface soils) were detected in concentrations exceeding 20 times their health-based drinking water values, while the metals antimony, arsenic, barium, beryllium, chromium, lead, nickel, and zinc were detected in either the surface or subsurface soil samples in concentrations that exceed their respective soil protective of groundwater values. These results indicate a potential threat to the groundwater.

It is recommended to perform leachate testing on AOC A surface and subsurface soil samples to determine if the potential threat to the groundwater is substantiated by leachate testing. Leachate testing should be completed for the SVOCs and metals listed in the previous paragraph using procedures approved by the Michigan Department of Natural Resources.

AOC B: Motor Pool Drainage Ditch - Organic compounds, indicative of past spills or the disposal of potentially toxic or hazardous substances were detected in the soils at AOC B. SI analytical results indicate that no compounds were detected in the soils in concentrations which exceed generic industrial direct contact values. Phenanthrene (surface soils) was quantified in excess of the residential 20 times health-based drinking water value, indicating a potential threat to the groundwater. The metals antimony, arsenic, beryllium, cadmium, chromium, lead, mercury, nickel, and zinc were detected in surface and/or subsurface soils

in concentrations their respective soil protective of groundwater values.

Similar contaminant profiles exist in the soils at Sites 1 and AOC B (geographically continuous areas). Because of this, AOC B was included with Site 1 in the Internal Draft Remedial Investigation Report (EARTH TECH, June 1995). It is recommended to continue the evaluation of AOC B through the Remedial Investigation process.

AOC C: Fire Training Area - South - Residual hydrocarbons (non-target, tentatively identified compounds as quantified on the SVOC analysis) indicative of past fire training exercises were detected in the soils and groundwater beneath AOC C. The results obtained from the SI suggests the extent of these hydrocarbon-containing soils have been delineated. SI results indicate that no compounds were detected in the soils in concentrations which exceed generic industrial direct contact values. No VOCs or SVOCs were detected in concentrations exceeding the residential 20 times health-based drinking water values. No SVOCs (TCLP extraction and analysis) above the analytical detection limit were detected in the leachate from the hydrocarbon-containing soils. These data suggest that the organic compounds detected in the soils pose no substantial threat to the groundwater beneath AOC C. The data are reinforced by the groundwater analytical results, which show no VOCs or SVOCs present in concentrations above the residential health-based drinking water values. These results were obtained from one groundwater sample collected at the water table from beneath the source area. The metals antimony, arsenic, beryllium and nickel were detected in one or more AOC C soil samples in concentrations exceeding their respective soil protective of groundwater values; further analysis shows that only antimony was present in the subsurface soils in an average concentration exceeding the soil protective of groundwater value. However, antimony was not detected in the hydrocarbon-containing soils in concentrations exceeding the soil protective of groundwater value suggesting the use of fuels during fire training exercises was not the cause of the elevated antimony. Metals were not detected in the groundwater sample in concentrations exceeding the residential health-based drinking water values. No further actions are recommended for AOC C.

AOC D: Fire Training Area - West - Hydrocarbons indicative of residual contamination from past fire training exercises were not detected in the soils collected and analyzed during the SI.

No VOCs or SVOCs were detected above the applicable NREPA PA451 criteria for surface and subsurface soils collected and analyzed during the SI. Arsenic, beryllium, mercury, and zinc were detected in either the surface or subsurface soil samples in concentrations exceeding the soil protective of groundwater values.

The surface of AOC D is proposed for soil stabilization and capping as part of the Source Removal Action Plan (SRAP - The Earth Technology Corporation, June 1994). No data collected during this SI would indicate that alternative or additional interim remedial measures are needed across AOC D. No further remedial actions, beyond what are proposed during the SRAP (The Earth Technology Corporation, June 1994), are recommended for AOC D.

AOC E: Old Hangar (Building 6901) - No VOCs or SVOCs at concentrations exceeding the applicable NREPA PA451 values or indicative of the disposal of waste POL or solvents were detected in the soils collected and analyzed from AOC E. Arsenic and beryllium were detected the soil samples in concentrations exceeding their respective soil protective of groundwater values, indicating a potential threat to groundwater. Unlike AOC A for example, where the elevated metals detections are associated with hydrocarbons, the detections of arsenic and beryllium at AOC E which exceed the soil protective of groundwater values are not associated with the presence of hydrocarbons. The AOC E metals detections are considered outliers and not the result of spills or the disposal of potentially hazardous substances. No further actions are recommended for AOC E.

AOC F: New Hangar (Building 6900) - SI analytical results indicate that no compounds were detected in the soils in concentrations which exceed generic industrial direct contact values. Methylene chloride was the only organic compound detected within the subsurface soils at a concentration exceeding its respective residential 20 times health-based drinking water criteria, indicating a potential threat to the groundwater. However, methylene chloride is a common laboratory contaminant and the result presented in this report was qualified B by the laboratory which indicates some type or blank contamination. Methylene chloride was reportedly used by the non-destructive interference shop, which is currently located in this hangar. Although methylene chloride is considered a common laboratory contaminant, its use in the new hangar suggests that it may have originated from disposal or waste handling

activities. This area is covered by asphalt and receives very little if any direct surface infiltration. In addition, the methylene chloride was quantified above NREPA PA451 criteria only in the 1 to 3 ft below ground surface interval, suggest that the compound is not moving vertically down through the soil column. The methylene chloride detection in the subsurface soils, although detected in a concentration exceeding the residential 20 times health-based drinking water value is not considered a significant threat the shallow groundwater beneath AOC F. Antimony, arsenic and beryllium were each detected above the soil protective of groundwater value, indicating a potential threat to the groundwater; further analysis indicates only antimony and beryllium are present in the subsurface soils in average concentrations above the soil protective of groundwater values. However, because the area is covered by asphalt and receives very little, if any, direct surface infiltration, the potential threat to the groundwater is minimized.

No further actions are recommended for AOC F.

1.0 INTRODUCTION

This report documents Preliminary Assessment (PA)/Site Inspection (SI) activities that The Earth Technology Corporation (EARTH TECH) performed at the 110th Fighter Wing (FW), Michigan Air National Guard (MIANG), W.K. Kellogg Regional Airport; Battle Creek, Michigan under the U.S. Department of Defense (DOD) Installation Restoration Program (IRP). The field activities described in this report were conducted between October 19, 1993 and July 16, 1994. The PA/SI activities were implemented in general accordance with the PA/SI Work Plan, which was approved by the Air National Guard Readiness Center (ANGRC) in March 1994. The following subsections describe the background of the IRP, present the purpose of the PA/SI program, outline the scope of the report, and discuss the methodology of the investigation.

1.1 PURPOSE OF THE INSTALLATION RESTORATION PROGRAM

DOD has initiated the IRP to identify, evaluate, and remediate suspected environmental problems associated with past usage, storage, handling, and disposal of hazardous substances at DOD facilities. Section 120 of the Superfund Amendments and Reauthorization Act (SARA) of 1986 requires that IRP activities adhere to the procedures which are specified in the National Contingency Plan (NCP) Final Rule [55 FR 8666]. The NCP details a sequence of steps to be followed when investigating and cleaning up hazardous waste sites. This sequence begins with the discovery of a suspected hazardous waste release or threat of release and ends with a permanent remedy to eliminate or minimize the environmental impact and long-term monitoring of the remediation effort. The five phases that constitute the IRP process as well as the purpose and activities associated with each phase are presented below:

- Preliminary Assessment - A PA is conducted to identify and evaluate the type and location of suspected problems associated with past hazardous waste handling procedures, disposal sites, and spill sites. This is accomplished through interviews with past and present base employees, historical records searches, and visual site inspections. In addition, detailed geological,

hydrogeological, meteorological, land use, and environmental data for the area of study are gathered. A detailed analysis of all information obtained identifies areas of concern. The initial PA for the base was conducted by the Hazardous Materials Technical Center (HMTC) in 1987. This supplemental PA was completed based on the potential that additional areas exist on base which may have been impacted by past waste handling activities.

- Site Inspection/Site Investigation - The purpose of this SI is to acquire the necessary data to either confirm or deny the existence of contamination at each identified area of concern. A *Site Investigation* is similar in purpose to a SI, but can be expanded to include a preliminary evaluation of the potential risks to human health, welfare, or the environment. Site Investigations can also identify specific chemical contaminants, their concentrations in environmental media, and determine the potential for contaminant migration through site-specific hydrogeologic investigations. A Site Investigation for the base was previously conducted by Engineering-Science (ES) in 1991. This SI was completed based on the results of the supplemental PA.

- Remedial Investigation - During a Remedial Investigation (RI) the necessary data are acquired to define the extent of confirmed contamination and to assess the associated risks to human health, welfare, or the environment. The RI quantifies the magnitude and the extent of contamination at the sites, as well as identifies the specific chemical contaminants present and their concentrations in environmental media. A determination is also made as to the potential for contaminant migration by assessing site-specific hydrogeologic and contaminant characteristics.

- Feasibility Study - A Feasibility Study (FS) is performed to develop the remedial action alternative that mitigates confirmed contamination at each site and meets the applicable and or relevant and appropriate requirements (ARARs). The FS considers risk assessments and cost benefit analyses in providing the necessary data, direction, and documented supportive rationale to acquire

regulatory concurrence (federal, state, and local) with the recommended remedial alternative. During the FS, recommendations are evaluated, developed, and provided for remedial actions at each site where remediation is required.

- Remedial Design - The purpose of Remedial Design (RD) is to provide engineering design drawings and construction specifications which are required to implement the recommended remedial action selected through the FS process.

- Remedial Action - The Remedial Action (RA) is the implementation of the RD. A RA requires appropriate regulation acceptance prior to implementation.

The IRP requires the identification and evaluation of environmentally deleterious sites on DOD installations and the control of adverse effects on human health and the environment from those sites. The ANGRC, through a U.S. Air Force interagency technical support agreement with the U.S. Department of Energy (DOE), uses Lockheed Martin Energy Systems, Inc. (LMES) to provide technical assistance for the implementation of the Air National Guard (ANG) IRP. EARTH TECH has been retained by LMES under the Hazardous Waste Remedial Actions Program (HAZWRAP) to conduct additional IRP PA/SI activities at the base.

1.2 PURPOSE OF THE PRELIMINARY ASSESSMENT/SITE INSPECTION

Information gathered by MIANG personnel subsequent to the initial PA and SI activities suggested that additional environmental areas of concern (AOC) exist on the base. This PA/SI was conducted not only to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites, but also to determine if any newly-identified AOC warrant classification as formal IRP Sites. The objectives of the PA/SI (for each AOC identified) are to provide one or more of the following recommendations: (1)

develop a plan and initiate immediate response actions, (2) take no further action, (3) initiate a Focused Feasibility Study, where appropriate, to select a Remedial Measure, or (4) continue characterizing those AOC where contamination was confirmed by proceeding with the RI/FS.

1.3 SCOPE

This report summarizes the work completed to date, presents and interprets the findings of the investigation, and states the conclusions and recommendations reached as a result of the PA/SI activities. This report contains the following sections:

- **Section 1. Introduction** - The remainder of this section discusses the methodology of the PA/SI.

- **Section 2. Facility Background** - Section 2 describes the location of the base, its history and organization, and previous IRP activities conducted at the base.

- **Section 3. Environmental Setting** - Section 3 includes a discussion of the regional climate, the regional and local geology, the regional and local hydrology, and the critical habitats and endangered or threatened species found in the vicinity of the base.

- **Section 4. Site Evaluation** - Section 4 presents an overview of the PA activities, identifies and describes the AOC, and presents recommendations and conclusions based upon the findings of the PA.

- **Section 5. Field Program** - Section 5 discusses the general approach of the SI field program and includes variations between the proposed Work Plan activities and the actual fieldwork performed. Investigation-derived waste and disposal is also addressed in this section.

- **Section 6. Investigation Results** - Section 6 presents the laboratory analytical data for the soil and groundwater samples collected during the SI field effort.

- **Section 7. Summary, Conclusions, and Recommendations** - Section 7 presents site-by-site conclusions and recommendations based upon the investigation results of the PA/SI.

- **Section 8. Bibliography** - A bibliography is included as Section B.

Additional information that can be found in this PA/SI report includes a list of acronyms and abbreviations, appendices detailing the results of the soil organic vapor survey, boring logs, soil and groundwater screening results, and analytical reports. Field change request forms and chain-of-custody forms are also provided.

1.4 METHODOLOGY

Activities conducted during the PA included the review of relevant records (from on-base and outside agencies) and personnel interviews. This information was then assessed in order to determine when and where a release might have occurred and the volume of potentially hazardous materials, wastes, and/or spills, if any, that were released into the environment. Preliminary identification of potential AOC was made during the PA/SI kickoff meeting. Following evaluation of the interviews, records, and data, AOC-specific sampling and analysis strategies were prepared (SI phase) and incorporated into the PA/SI Work Plan (The Earth Technology Corporation, March 1994). The proposed field sampling activities were implemented in the summer of 1994.

2.0 FACILITY BACKGROUND

The following sections briefly describe the base location, summarize the base history and organization, and discuss previous IRP activities.

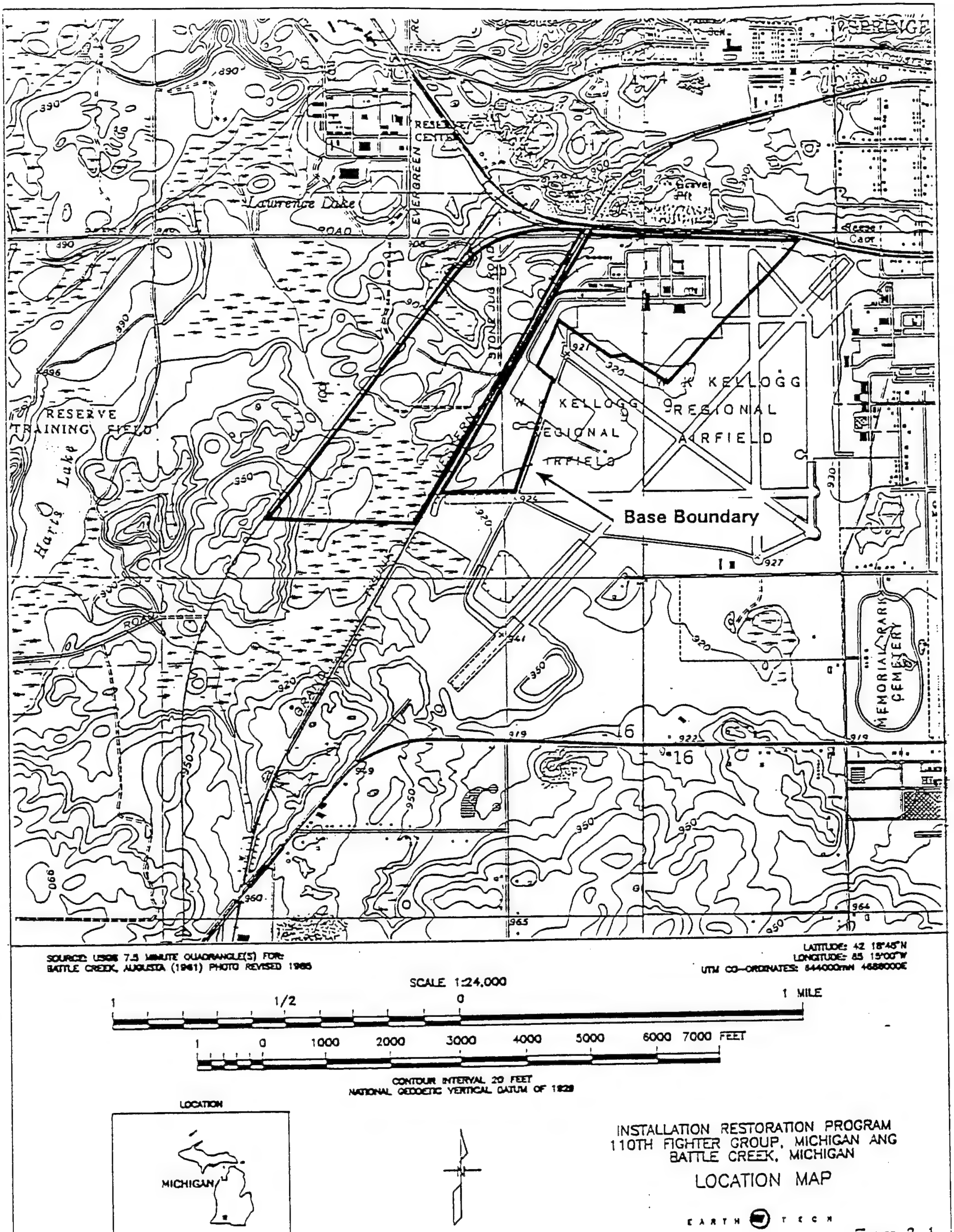
2.1 BASE LOCATION

The base is located in south-central Michigan at the W. K. Kellogg Regional Airport in southwest Battle Creek (Figure 2-1). Battle Creek is located in Calhoun County, approximately 100 miles west of Detroit and 20 miles east of Kalamazoo. The base occupies approximately 315 acres in the northwestern portion of the airport, approximately 204 acres of which are separated from the main portion of the base by the Grand Trunk Western Railroad (Figure 2-2). Runway facilities at the airport are used jointly for military and civilian purposes.

2.2 ORGANIZATION AND HISTORY

Prior to 1924, the property on which the base is located was used for agricultural purposes. In September of 1924, a lease with an option to buy the property was signed by the Battle Creek Chamber of Commerce. Four years later, W. K. Kellogg donated the necessary money to purchase and make improvements to the site. The Army Air Corps utilized the airport for combat duty training and to stage crews for overseas deployment from 1942 until 1946. During this time, new runways were constructed and existing runways were lengthened. Buildings were also erected to house base personnel and to support military functions. In 1986, the area that the base occupied was increased from approximately 90 acres to 315 acres.

The very same year that the Army Air Corps ceased using the airport, the 172nd Fighter Squadron of the MIANG was formed and Kellogg Field was designated as its headquarters. In 1951, the unit was called to active duty as part of the 56th Fighter Wing at Selfridge Air Force Base in Michigan. The unit was redesignated as the 172nd Fighter Bomber Squadron



Lawrence Lake
RESERVE CENTER
EVERGREEN
ROAD
Gravel Pit
RESERVE TRAINING FIELD
Harts Lake
W K KELLOGG REGIONAL AIRFIELD
W K KELLOGG REGIONAL AIRFIELD
Base Boundary
MEMORIAL PARK CEMETERY
16
SOURCE: USGS 7.5 MINUTE QUADRANGLE(S) FOR:
BATTLE CREEK, AUGUSTA (1961) PHOTO REVISED 1985
LATITUDE: 42 18'45"N
LONGITUDE: 85 15'00"W
UTM CO-ORDINATES: 644000mN 4688000E
SCALE 1:24,000
1 1/2 0 1 MILE
1 0 1000 2000 3000 4000 5000 6000 7000 FEET
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
LOCATION
MICHIGAN
INSTALLATION RESTORATION PROGRAM
110TH FIGHTER GROUP, MICHIGAN ANG
BATTLE CREEK, MICHIGAN
LOCATION MAP
EARTH TECH

Figure 2-1

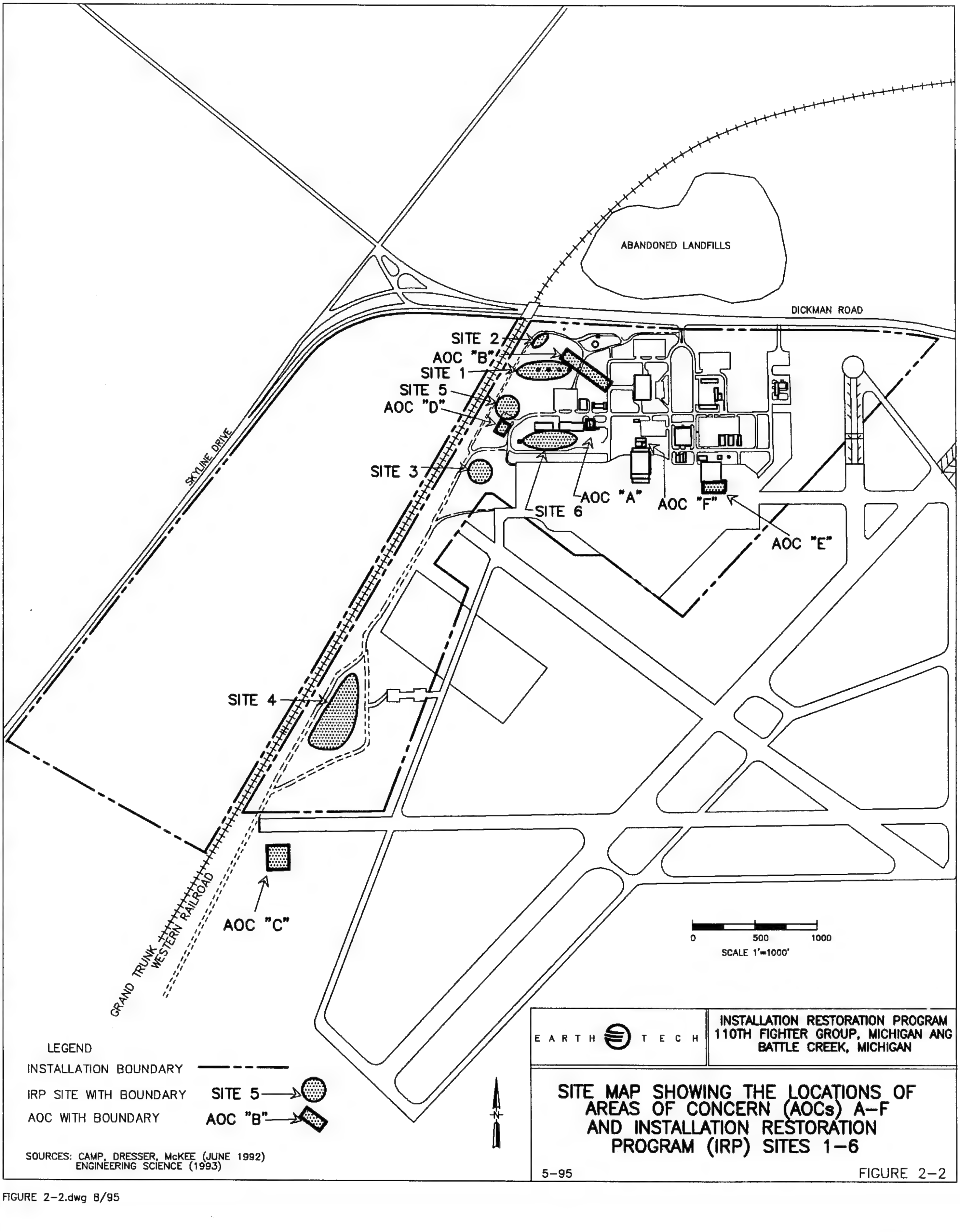


FIGURE 2–2.dwg 8/95

when it returned to Kellogg Field the following year. In 1955, the unit was reorganized as the 172nd Fighter Interceptor Squadron which was upgraded to the 110th FG the very next year. This unit was deactivated and redesignated the 172nd Tactical Reconnaissance Squadron two years after it had been upgraded. In 1962, the base was reorganized again, and the 172nd Tactical Reconnaissance Squadron became the 110th Tactical Reconnaissance Group. This unit was replaced by the 110th Tactical Air Support Group in 1971. In 1992, the unit was reorganized as the 110th Fighter Group (FG) and assigned the A-10 aircraft which it currently operates. The 110th FG was renamed the 110th FW in August 1995. Throughout its history, the base has stored and used various types of potentially hazardous materials in support of its primary fighter mission. Historical operations and their relationship to historic waste handling and disposal activities are described in Section 4.0.

2.3 PREVIOUS IRP ACTIVITIES

Previous IRP activities are discussed in the following subsections. In addition to the IRP activities at the base, an Environmental Assessment (EA) of the base area was conducted by Hickok and Associates (Hickok, 1985). The EA did not address potential contamination due to the past activities of existing facilities on the base.

2.3.1 Preliminary Assessment

An IRP Phase I PA was conducted in 1987 to identify and assess past operations at the base that may have involved storage or disposal of hazardous materials or wastes (HMTC, 1987). The purpose of the assessment was to evaluate the potential for environmental releases from hazardous materials and waste management practices. Four sites (1 through 4 as described in Section 2.3.3) were identified as potential sources of contaminant release and were recommended for further investigations. Sites 5 and 6 were added to the Site Investigation after completion of the PA.

2.3.2 Immediate Response Investigation

Upon completion of the 1987 PA, an Immediate Response Investigation (ES, 1988) was completed to assess groundwater quality at the base boundary. Fifteen monitoring wells (BC-MW1 through BC-MW15) along the northern and southern base boundaries were installed, sampled, and analyzed. These groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and priority pollutant (PP) list metals. VOCs and elevated concentrations of metals were detected in several of the samples.

After the Immediate Response Investigation report was finalized, the analytical data became suspect. A laboratory audit showed numerous problems with the laboratory's quality assurance (QA) and quality control (QC) procedures, rendering a majority of the data unuseable. These problems are addressed in the QA report for the SI analyses conducted in 1988 (ES, November 1993).

2.3.3 Site Investigation

A Site Investigation for the six sites listed below was initiated in November 1988 and a Final Site Investigation Report was issued by ES in November 1993. The locations of Sites 1 through 6 are presented on Figure 2-2. A brief description of the sampling results for each site follows:

<u>Site 1: Fuel Tank Farm</u>

The Fuel Tank Farm was used for gasoline storage until 1949 and for the storage of heating fuel in 1973 and 1974. During this latest time period, leakage of fuel was reported. The tanks were removed in 1988. The Site Investigation soil sampling results from 1988 were not useable due to poor data quality and lack of laboratory QA/QC procedures (ES, November 1993). Although soil contamination at Site 1 was not quantified, the data did indicate the presence of petroleum products in the soil. Soil staining and petroleum odor were noted during drilling operations. Monitoring well BC2-MW1, located down-gradient of Site 1, was free of contamination associated with fuels. The removal of contaminated soil at the site was

recommended in the Final Site Investigation Report. The ANGRC determined that additional soil and groundwater sampling was necessary prior to remedial actions, if appropriate, for Site 1. An RI Work Plan was completed for Site 1 (EARTH TECH, September 1994).

Site 2: Drainage Swale

The drainage swale is a topographic depression that receives storm water run-off from the northern half of the base. Surface water accumulating in the swale is removed by the processes of evaporation and infiltration. Both sediment and surface water samples from the drainage swale were collected and analyzed. SVOCs exceeding the risk-based ARARs were found only in the sediments at the bottom of the swale, whereas metals exceeding these levels were found in both sediments and surface waters. Down-gradient groundwater monitoring wells were found to contain 1,1,2,2-tetrachloroethane in concentrations slightly exceeding the risk-based criteria (ES, November 1993). The Site Investigation Report recommended a FS be completed for Site 2. A Source Removal Action Plan and Plans and Specifications for capping have been developed for Site 2 (ES, July, 1994).

Site 3: Fire Training Area

The Fire Training Area (FTA) is a bermed earthen area used for fire training activities between 1977 and 1986. Waste oils, jet fuel, hydraulic fluids and spent solvents were reportedly floated on water inside the bermed area, ignited, and extinguished. Data is not available to quantify contaminant levels in Site 3 soils. However, the 1988 data indicated high concentrations of fuel constituents in the soil. Lead was detected in concentrations estimated to exceed Michigan Environmental Response Act 307 Type A (Type A) default criteria. The Site Investigation recommended a FS be completed for this site. The site was selected for a bioventing pilot study which was initiated in September 1992 (ES, November 1992). These results show that benzene, toluene, ethylbenzene, and xylene (BTEX) concentrations and total petroleum hydrocarbons (TPH) concentrations have decreased significantly in the Site 3 soils (Air Force Center for Environmental Excellence, May 17, 1994).

Site 4: Abandoned Landfill

The abandoned landfill was used for the disposal of concrete and asphalt during runway repairs. Empty drums and paint cans, noted during the PA (HMTC, 1987), were found at the site. No contaminants were detected in the groundwater samples that were collected from the Site 4 monitoring wells. Soil contamination was not quantified. The Site Investigation Report stated that a decision document should be prepared for Site 4 recommending no further action (ES, November 1993).

Site 5: Former Coal Storage Area

Coal particles remaining in the soil at the former Coal Storage Area have been exposed to the environment, which may have resulted in the leaching of contaminants into the ground or surface water. No useable data for the evaluation of soil contamination was collected during the Site Investigation. Five additional hand-augered borings were drilled and soil samples collected at Site 5 during September 1992 (ES, March 1993). The analytical results from these samples indicated the presence of SVOCs and metals above the Type A and Michigan Environmental Response Act 307 Type B (Type B) cleanup criteria. The down-gradient monitoring wells at Site 5 contained 1,1,1-TCA and xylenes suspected to have originated from Site 3. A removal action was recommended for Site 5 in the Site Investigation Report (ES, November 1993). A Source Removal Action Plan (The Earth Technology Corporation, June 1994) and Plans and Specifications (EARTH TECH, July 1994) were developed for soil stabilization and capping of the area.

Site 6: Fuel Spill

The Fuel Spill site includes an underground jet fuel storage area. A 2,000 gallon fuel spill occurred at the ground surface as a result of an electrical system failure. Toluene and TPH were detected in Site 6 soils. One sample contained toluene in excess of the Type B cleanup criteria. VOCs, lead, and zinc were detected in groundwater from Site 6 monitoring wells.

However, the groundwater analytical results did not exceed any ARARs. A decision document recommending no further action was recommended for Site 6 in the Site Investigation Report (ES, November 1993).

3.0 ENVIRONMENTAL SETTING

A complete discussion of the base environmental setting will be presented in the following subsections.

3.1 METEOROLOGY

The Battle Creek region is characterized by a climate that is predominately continental in nature, although it frequently alternates between continental and semi-maritime conditions. Continental climates are characterized by pronounced differences in seasonal temperatures (i.e., hot summers and very cold winters). Semi-maritime climates experience moderate temperatures during the winter and summer. The variable nature of seasonal weather patterns in the area is caused by winds originating from the Great Lakes. When these winds extend into the Battle Creek region, the continental climate is replaced by a semi-maritime climate (HMTC, June 1987).

The Battle Creek area has an annual precipitation of 30.73 inches, based on the period from 1956 to 1985. Precipitation is fairly well distributed through the year, with the heavier amounts occurring as thunderstorms during May and June. Snowfall for the Battle Creek area is moderate, averaging about 52 inches per year (HMTC, June 1987).

Net precipitation was calculated according to the method outlined in the Federal Register (47 FR 31224, 16 July 1982), and was presented in the PA. A net precipitation value of 0.73 inches per year was obtained. Rainfall intensity based on 1 year frequency, 24 hour duration was 2.25 inches as calculated according to 47 FR 31235, 11 July 1982 (HMTC, June 1987).

3.2 PHYSIOGRAPHY AND TOPOGRAPHY

The base is located within the Central Lowland Physiographic Province of the Interior Plains. This region is characterized by its vast plain, relatively low altitude of 500 to 2000 ft above mean sea level (AMSL), and slight local relief.

The base consists of large paved areas and has a gently rolling to nearly flat topography (Figure 2-1). The mean elevation of the airport area is 941 ft AMSL (Hickok, 1985). Wet swampy areas occur in the portion of the installation west of the railroad tracks. Elevations on the western property range from 890 to 920 ft AMSL.

3.3 SOILS

The soils at Battle Creek are comprised primarily of five soil series, which have been given the United States Department of Agriculture (USDA) Soil Conservation Service names Houghton, Spinks, Oshtemo, Boyer, and Udorthents. The distribution of these soils within the vicinity of the base is shown in Figure 3-1. These soil series are described as follows:

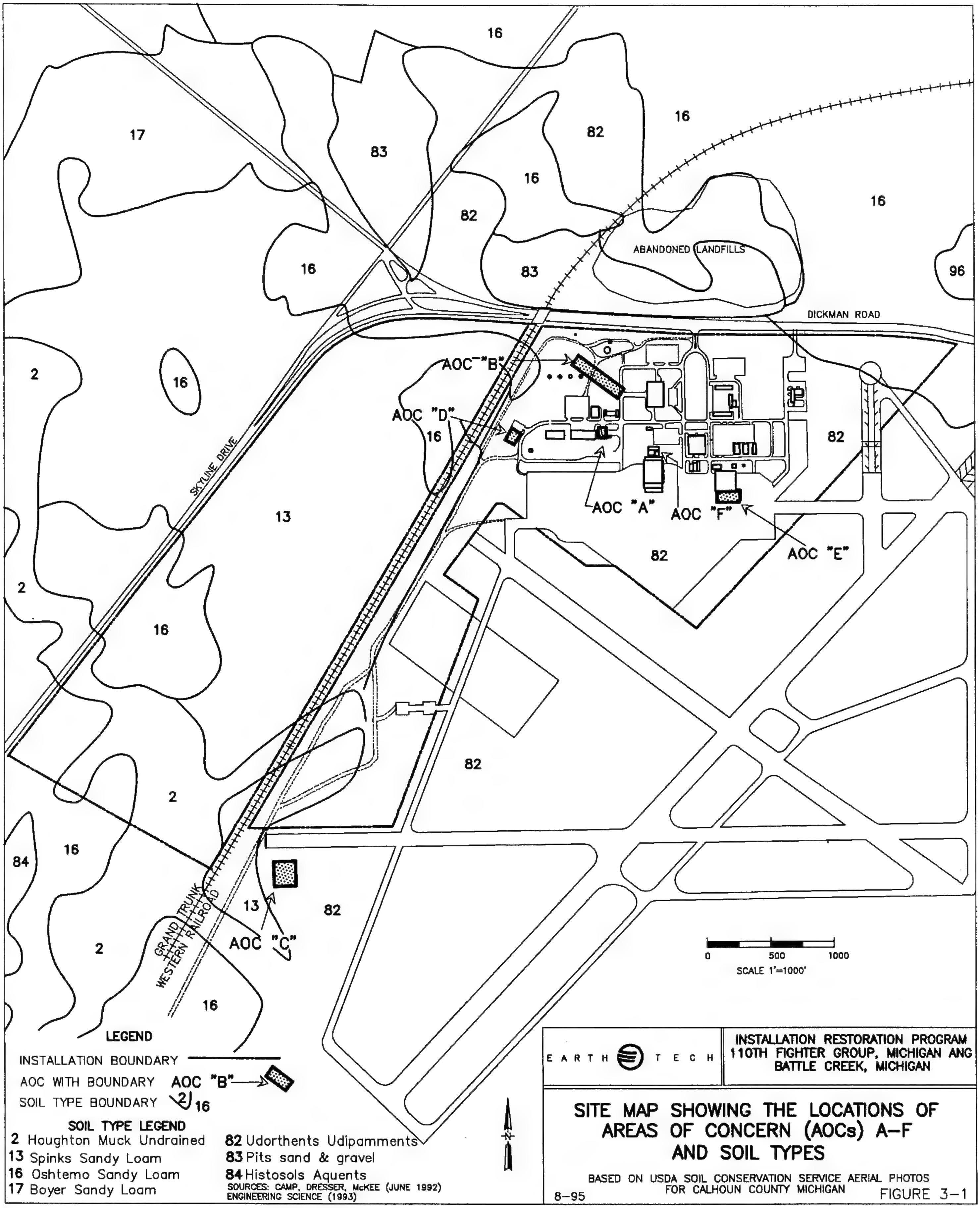
Houghton Series, 0 to 2 % slopes - This mapping unit consists of very poorly drained soils that were formed in herbaceous organic deposits, bogs, and other depressional areas within outwash plains, lake plains, till plains, and moraines.

Spinks Series, 0 to 18 % slopes - This mapping unit consists of very deep, well-drained soils formed in glaciofluvial deposits on moraines, till plains, beach ridges, and outwash plains.

Oshtemo Series, 0 to 18 % slopes - This mapping unit consists of well-drained soils formed in loamy and sandy glaciofluvial deposits on outwash plains and moraines.

Boyer Series, 0 to 12 % slopes - This mapping unit consists of very deep, well-drained soils formed in loamy and sandy glaciofluvial deposits on outwash plains, deltas, valley trains, and moraines.

Udorthents, 0 to 2 % slopes - This mapping unit consists of well-drained to excessively drained soils which have been mixed by land leveling, filling, or excavation.



SITE MAP SHOWING THE LOCATIONS OF AREAS OF CONCERN (AOCs) A–F AND SOIL TYPES

BASED ON USDA SOIL CONSERVATION SERVICE AERIAL PHOTOS FOR CALHOUN COUNTY MICHIGAN

8–95

FIGURE 3–1

FIGURE 3–1.dwg 8/95

In general, the permeability of these soils ranges from moderate (4.2×10^{-4} to 1.4×10^{-3} cm/sec) to rapid (4.2×10^{-3} to 1.4×10^{-2} cm/sec).

3.4 GEOLOGY

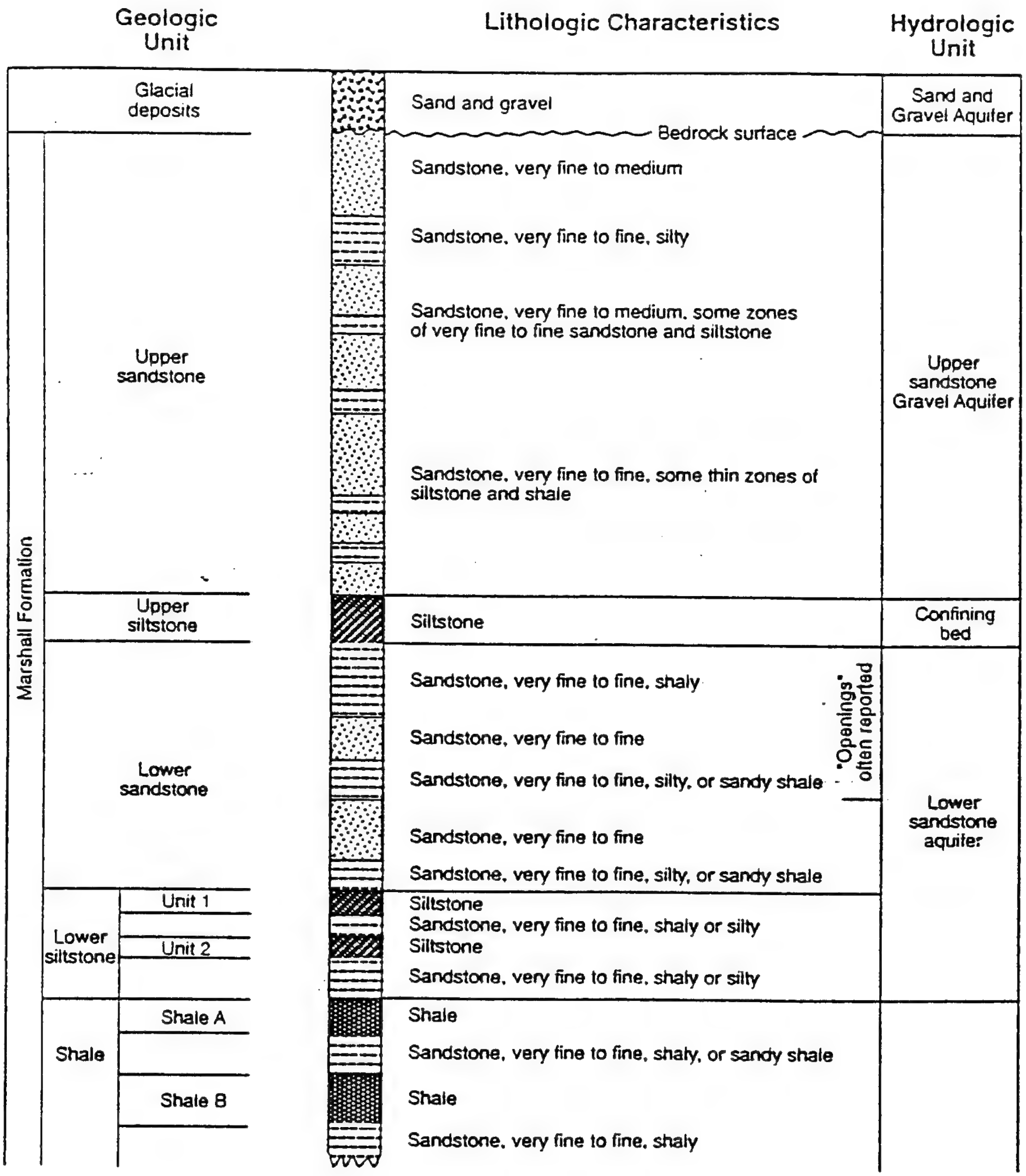
The regional and local geologic settings of the area will be presented in the next two subsections.

3.4.1 Regional Geology

South-Central Michigan, including the base, is located within the Michigan Basin of the Central Lowland Physiographic Province. A plain of Pleistocene-aged (Wisconsin Series) glacial advance deposits covers the Battle Creek area. Valleys and morainal ridges arranged in concentric arcs around the ends of the Great Lakes interrupt this plain. A regional stratigraphic column is shown in Figure 3-2.

Bedrock in the Michigan Basin (Figure 3-3) is Pennsylvanian-aged in the center and Cambrian-aged at the outer boundary of the basin. The geologic structure of the basin is expressed as small folds, fractures, and faults. These minor structural features are generally oriented to trend northwest - southeast in the Battle Creek area. Offsets in the trend of buried valleys and major bends in the Battle Creek River suggest folds, fractures, faults, or a combination of all three (Grannemann and Twenter, 1985).

In southern Michigan, the Pleistocene-aged glacial deposits consist of till, outwash, and channel deposits, derived principally from fragments of sandstone and shale, deposited as the last continental glacier retreated across Michigan. Composition and mode of deposition (glacier or meltwater) differentiated these deposits of sand, silt, clay, gravel, and boulders. The glacial deposits in the area range in thickness from a few feet to greater than 100 ft. The glacial deposits overlie the Paleozoic sedimentary bedrock which consists of sandstone, siltstone, and shale.



From Granneman and Twenter, 1985.

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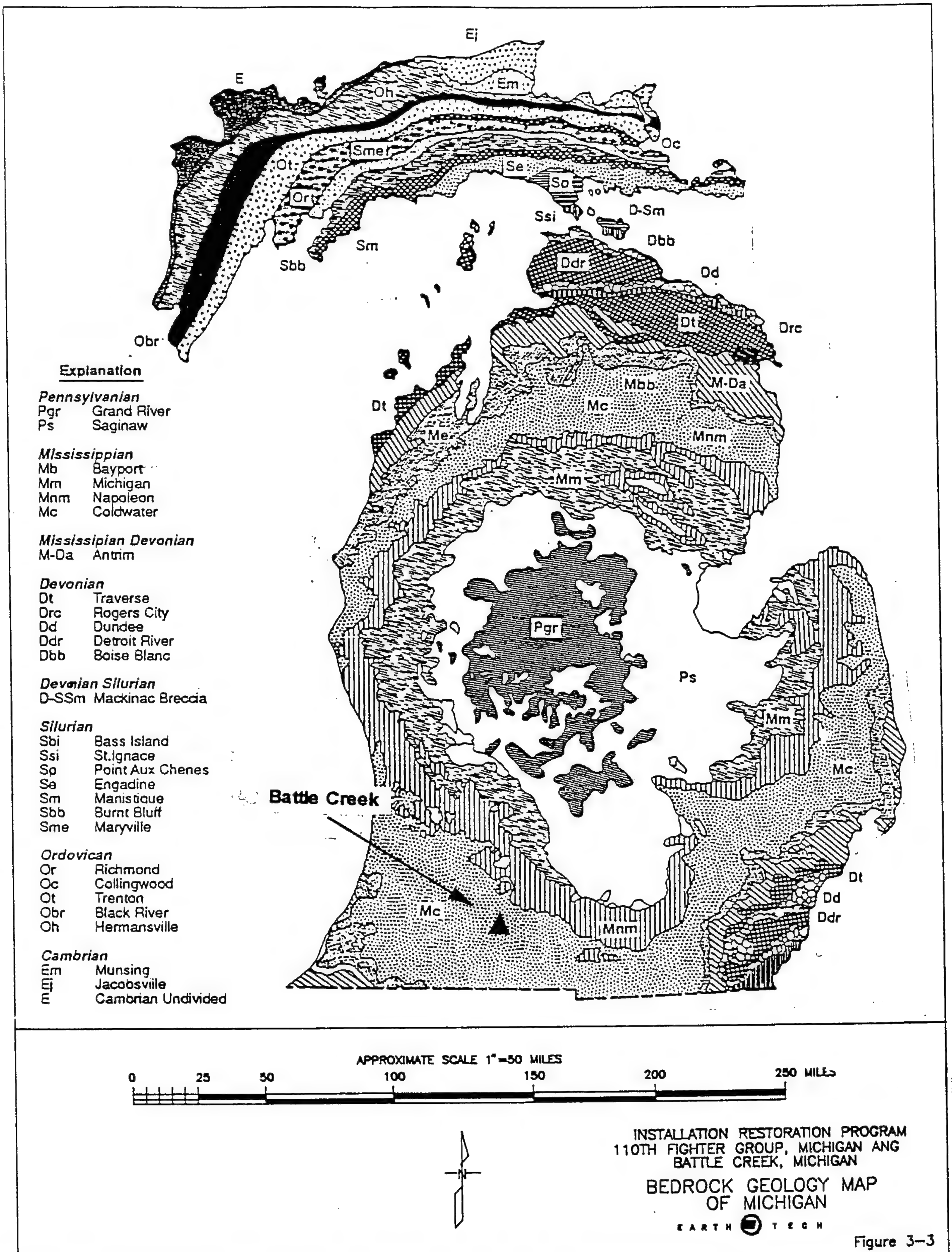
BATTLE CREEK, MICHIGAN

TYPICAL LITHOLOGIC COLUMN
IN BATTLE CREEK, MICHIGAN AREA

EARTH TECH

Figure 3-2



Ej
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Me
Mnm
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Ps
Mm
Mc
Battle Creek
Dt
Dd
Ddr
Mc
Mnm
Explanation
Pennsylvanian
Pgr Grand River
Ps Saginaw
Mississippian
Mb Bayport
Mm Michigan
Mnm Napoleon
Mc Coldwater
Mississipian Devonian
M-Da Antrim
Devonian
Dt Traverse
Drc Rogers City
Dd Dundee
Ddr Detroit River
Dbb Boise Blanc
Devonian Silurian
D-SSm Mackinac Breccia
Silurian
Sbi Bass Island
Ssi St.Ignace
Sp Point Aux Chenes
Se Engadine
Sm Manistique
Sbb Burnt Bluff
Sme Maryville
Ordovican
Or Richmond
Oc Collingwood
Ot Trenton
Obr Black River
Oh Hermansville
Cambrian
Em Munsing
Ej Jacobsville
E Cambrian Undivided
APPROXIMATE SCALE 1"=50 MILES
0
25
50
100
150
200
250 MILES
N
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110TH FIGHTER GROUP, MICHIGAN ANG
BATTLE CREEK, MICHIGAN
BEDROCK GEOLOGY MAP
OF MICHIGAN
EARTH TECH

Figure 3–3

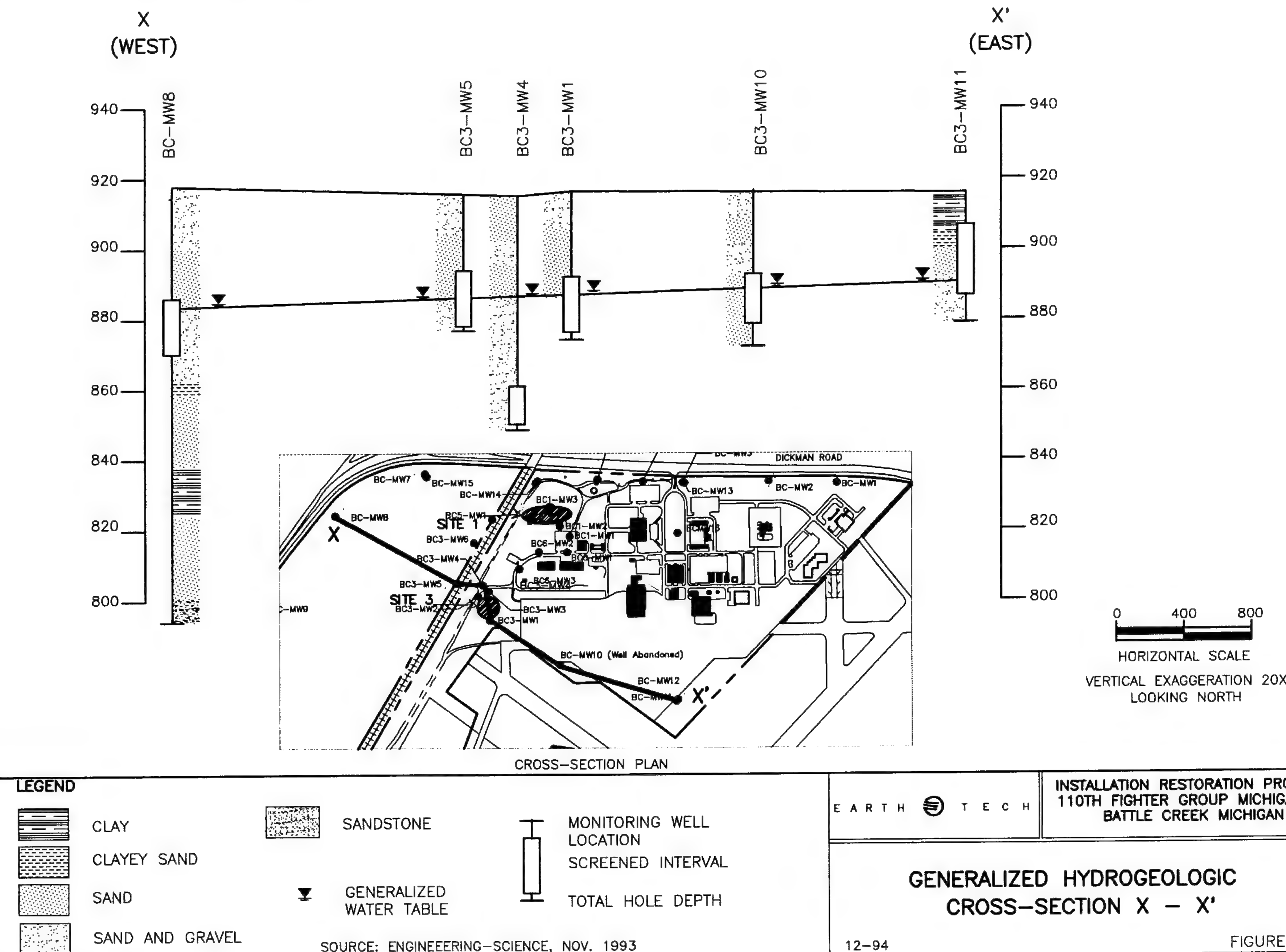
In the Battle Creek area, the Marshall Formation underlies the glacial deposits (Figure 3-2) and ranges in thickness from about 10 to 140 ft. This formation is very fine- to coarse-grained sandstone containing layers of siltstone, shale, and sandy shale (Grannemann and Twenter, 1985). The sandstones can be either hard or soft. The soft sandstones may have been cemented to a lesser degree or have had the cement material weathered away, leaving loose-grained sands. The well cemented or hard sandstones contain fractures and joints. The Marshall Formation overlies the Coldwater Shale which may be up to 1,300 ft thick and contain layers of sandstone, limestone, and cherty limestone (Vanlier, 1966).

3.4.2 Local Geology

The base is underlain by a mantle of Pleistocene-aged glacial drift material, approximately 100 ft thick overlying the Mississippian-aged Marshall Formation. This drift material consists of layers of sand, sand and gravel, and clay. The stratigraphy of the Pleistocene-aged glacial drift encountered beneath the base is illustrated by two geologic cross-sections labeled X-X' and Y-Y' presented in Figures 3-4 and 3-5, respectively. The on-base well locations used to prepare the sections are shown on figures presented in Section 3.5.3 of this report. The sands range in size from very fine-grained to very coarse-grained with a predominance of fine- to medium-grained sand. Sand layers are from 10 to 15 ft thick. Beds of sand and gravel are interlayered with the sand layers and are generally 10 to 20 ft thick.

Thin clay layers and silty or sandy clay layers are present in the deeper sections of the glacial drift material. Rock fragments are also common in deeper sections and may be derived from the loosely cemented Marshall Formation.

Grey clay layers, mainly sandy or silty, exist locally at depths of 65 to 115 ft. The clay layers usually directly overlie the Marshall Formation, which is described as a blue, soft, medium-grained, loosely cemented sandstone. The Marshall Formation has an irregular rolling and hilly surface probably due to preglacial stream erosion.



SOURCE: ENGINEEERING-SCIENCE, NOV. 1993

EARTH TECH

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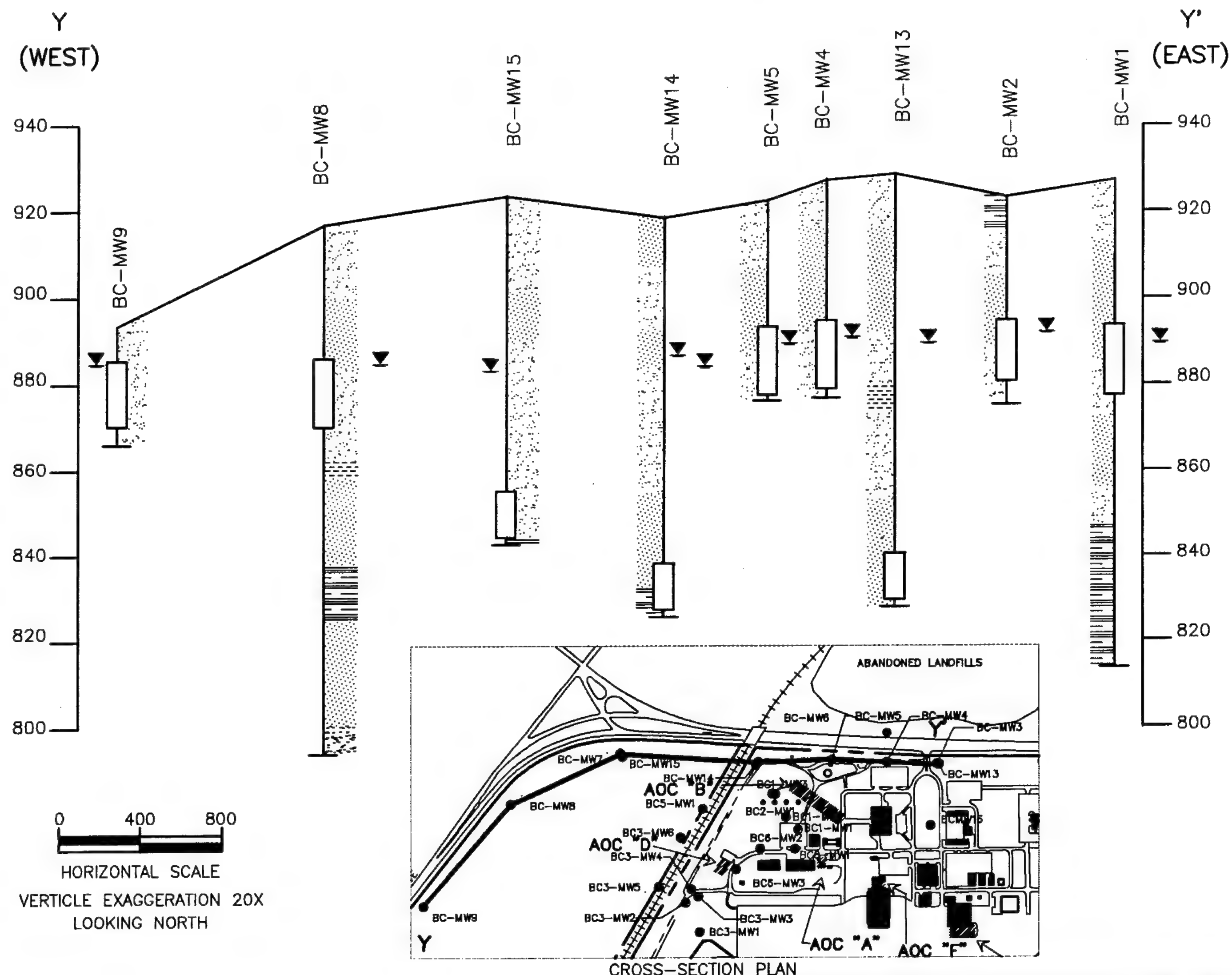
BATTLE CREEK MICHIGAN

GENERALIZED HYDROGEOLOGIC CROSS-SECTION X – X'

12-94

FIGURE 3-4

FIG_3-41.DWG 7/95
12-94



LEGEND

CLAY

CLAYEY SAND

SAND

SAND AND GRAVEL

SANDSTONE

GENERALIZED WATER TABLE

MONITORING WELL LOCATION

SCREENED INTERVAL

TOTAL HOLE DEPTH

SOURCE: ENGINEERING-SCIENCE, NOV. 1993

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GENERALIZED HYDROGEOLOGIC
CROSS-SECTION Y – Y'

7/95

FIGURE 3-5

FIG_3-51.DWG 7/95

3.5 HYDROLOGY

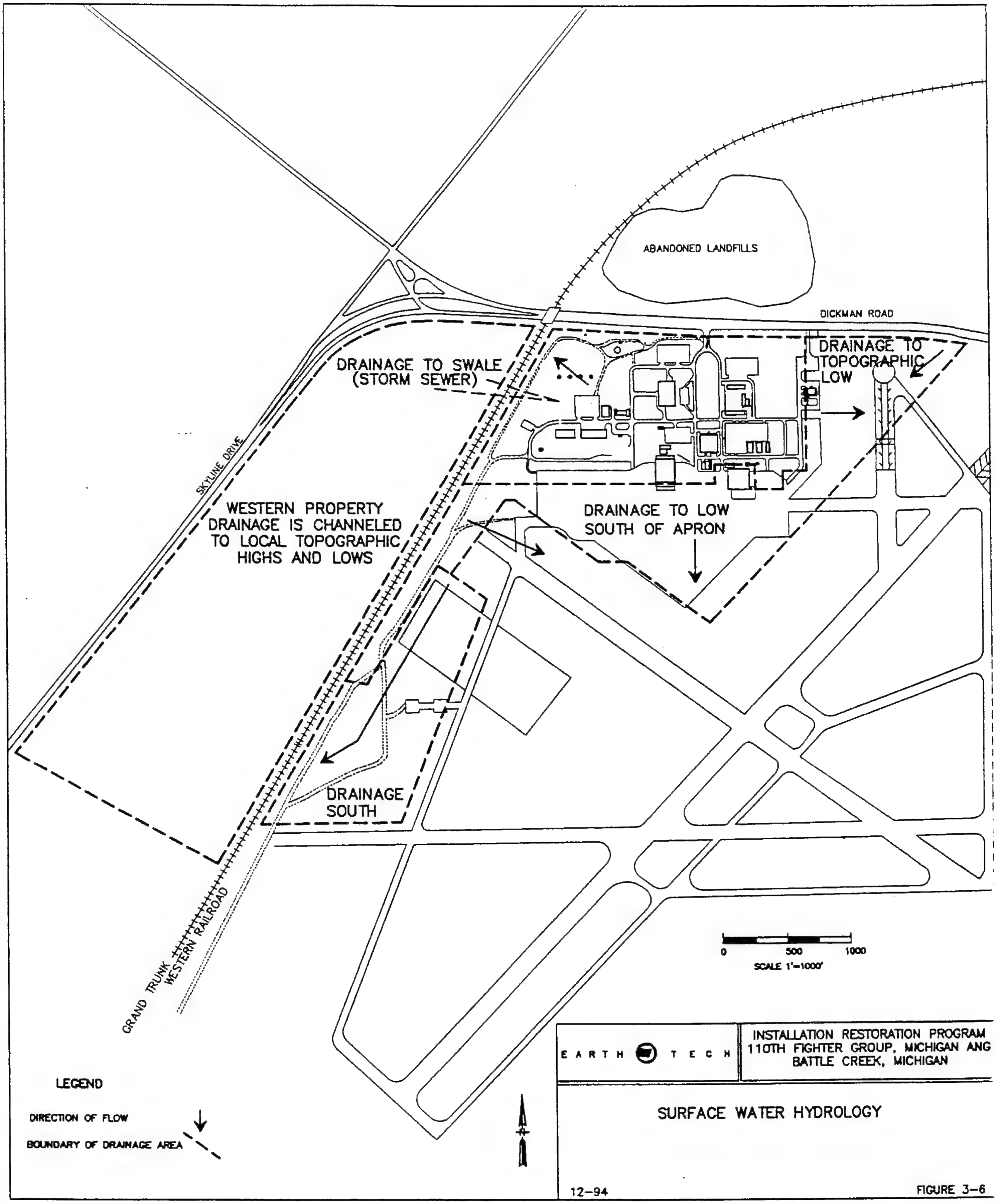
The regional and local hydrogeologic settings will be presented in the following subsections.

3.5.1 Surface Water

The major surface water features of the area are the Kalamazoo River, Harts Lake, and Goguac Lake. The Kalamazoo River is located approximately 1.5 miles north of the base, Goguac Lake is located approximately 2 miles southeast of the base, and Harts and Lawrence Lakes are located approximately 0.5 miles west of the base (Figure 2-1). Approximately one-third of the annual precipitation in the vicinity of the base flows into the Kalamazoo River by direct run-off, or by infiltrating or percolating into the ground and then discharging into the Kalamazoo River by underground flow. The remaining annual precipitation is returned to the atmosphere by transpiration and evaporation from plants (Vanlier, 1966). Localized ponding and wet areas occur throughout the Battle Creek area, but most streams in the area discharge into the Kalamazoo River.

Because of the generally low relief at the base, surface water drainage has been improved by the construction of storm sewers or drainage ditches. Figure 3-6 illustrates the general surface and storm water flow directions on the base. Surface water collected from the main portion of the base drains in a northerly direction to the drainage swale (IRP Site 2), while the tarmac and portions of the hangar drain in a southerly direction to a low area just off the apron. This area roughly corresponds with the "V" in the apron. There is no surface water outlet from this low area. A third area of the base, (southwest of the main base) is serviced by a storm sewer system that drains south and west. The outfall from this area goes under the Grand Trunk Western Railroad property and in the future will be the permitted storm sewer outfall.

The base is not within an area classified as a floodplain (Hickock, 1985). According to the Flood Insurance Rate Map (FIRM) for the city of Battle Creek, the W.K. Kellogg Airport, including the base, is in "Zone C", an area of minimal flooding from rivers (Federal Emergency Management Agency, FIRM, 14 April, 1983).


ABANDONED LANDFILLS
DICKMAN ROAD
DRAINAGE TO SWALE
(STORM SEWER)
DRAINAGE TO
TOPOGRAPHIC
LOW
SKYLINE DRIVE
WESTERN PROPERTY
DRAINAGE IS CHANNELED
TO LOCAL TOPOGRAPHIC
HIGHS AND LOWS
DRAINAGE TO LOW
SOUTH OF APRON
DRAINAGE
SOUTH
GRAND TRUNK WESTERN RAILROAD
0 500 1000
SCALE 1"=1000'
LEGEND
DIRECTION OF FLOW
BOUNDARY OF DRAINAGE AREA
EARTH TECH
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BATTLE CREEK, MICHIGAN
SURFACE WATER HYDROLOGY
12-94
FIGURE 3-6

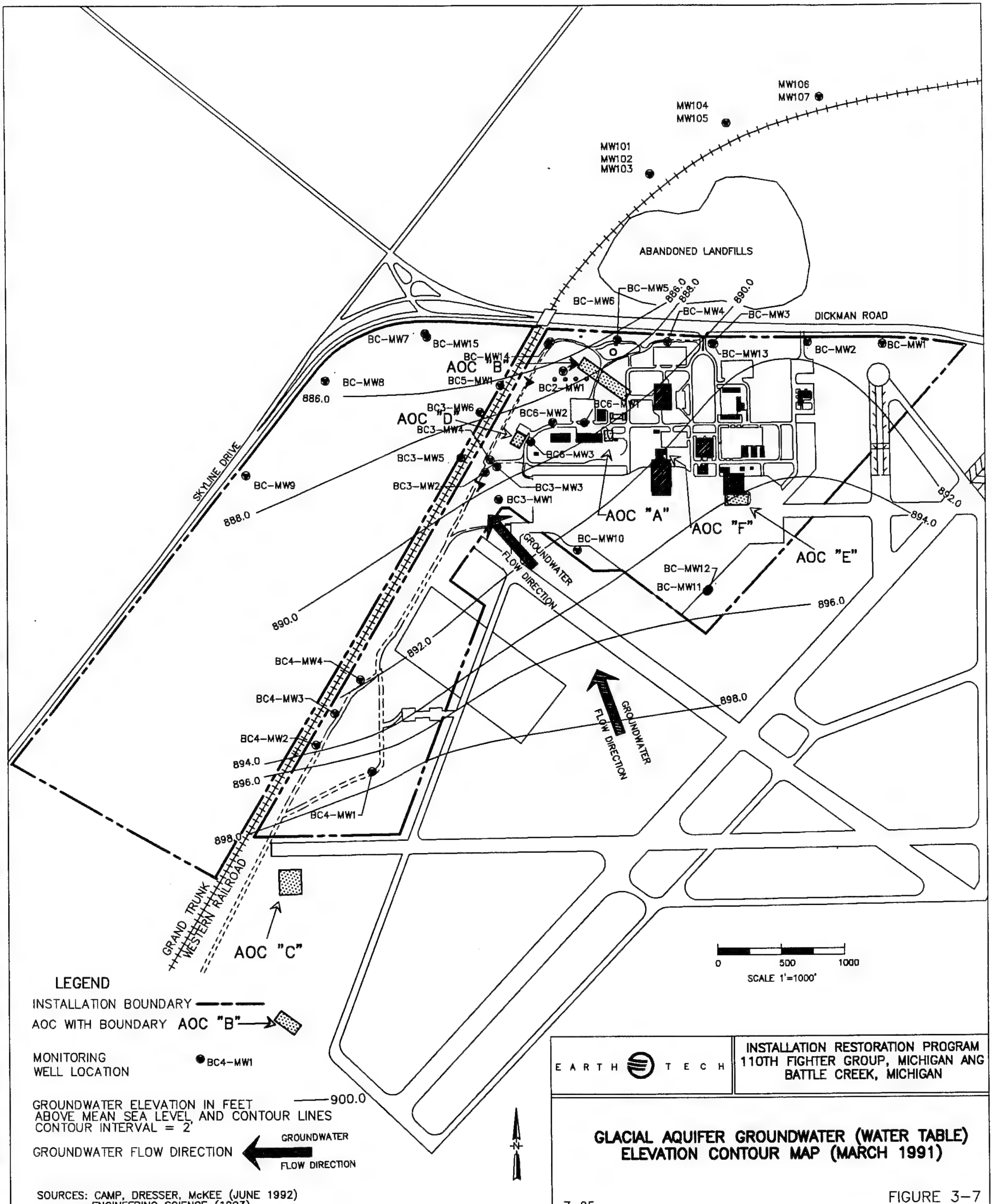
3.5.2 Regional Hydrogeology

Groundwater occurs in useable quantities in both the glacial deposits and the Marshall Formation in the Battle Creek area. These two aquifers are reported to be connected hydrologically, although relatively impermeable clay layers may be present locally in sufficient thickness to retard water movement between the glacial materials and the Marshall Formation. In some areas, the two aquifers function as a single hydrologic unit. Most of the water that enters the glacial aquifer eventually moves to the Marshall Formation and is discharged to stream flow or as well withdrawals (HMTC, 1987). Although it is generally used only for domestic supplies, the glacial aquifer produces water of sufficient quality and quantity for municipal supplies. The depth to the groundwater in the glacial aquifer varies with topography, gradients, and surface water flow patterns. The glacial aquifer is recharged directly from precipitation and infiltration. Horizontal conductivities in the glacial aquifer range from 15 to 110 ft per day (HMTC, 1987).

3.5.3 Local Hydrogeology

Groundwater beneath the base occurs in the surficial glacial drift and in the Marshall sandstone under unconfined conditions. The glacial aquifer beneath the base consists of very fine to coarse sand, gravel, silt, and sandy clay. Limited data indicate that the glacial aquifer is approximately 110 to 135 ft thick. Some of these deposits include significant amounts of clay and silt-sized materials which reduce permeability in these areas. However, in other areas, these finer particles have been washed out of the sand and gravel deposits, which increases the permeability of these deposits.

The depth to the glacial aquifer water table beneath the base ranges from approximately 10 to 40 ft below land surface. Groundwater elevations range from approximately 899 ft AMSL at Site 4 to approximately 884 ft AMSL at the northern base boundary. The general groundwater flow direction across the base is to the northwest, although a radial pattern is exhibited at the central portion of the northern base boundary. Glacial aquifer water level elevations and flow directions beneath the base in March 1991 and May 1994 are shown in Figures 3-7 and 3-8, respectively. Recharge to the surficial aquifer is due to infiltration of



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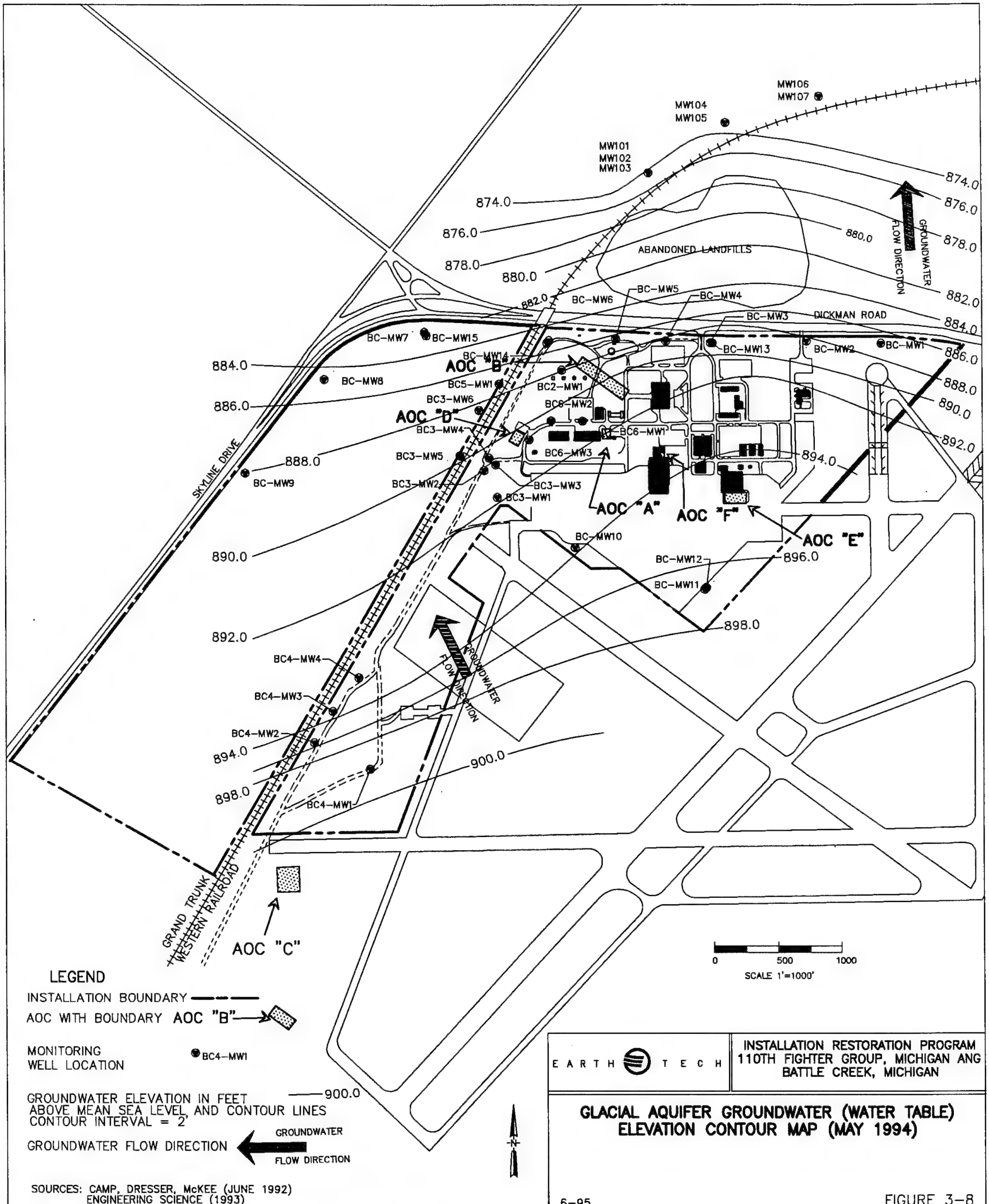
GLACIAL AQUIFER GROUNDWATER (WATER TABLE) ELEVATION CONTOUR MAP (MARCH 1991)

7-95

FIGURE 3-7

FIG_3-7.DWG 7/95

fig_3-7.dwg 5/95



GLACIAL AQUIFER GROUNDWATER (WATER TABLE) ELEVATION CONTOUR MAP (MAY 1994)

FIGURE 3-8

FIG_3-8.DWG 7/95 1maygwel.dwg 6/95 (FIG-_3-8)

precipitation and surface water. Movement of water into the Marshall sandstone may be hampered where the glacial drift material has a higher clay content. A thick clay layer is present under portions of the base but is not extensive over the entire area (ES, November 1993). The water table elevations from 1987-1989 (ES, November 1993) show a pattern similar to those in Figures 3-7 and 3-8.

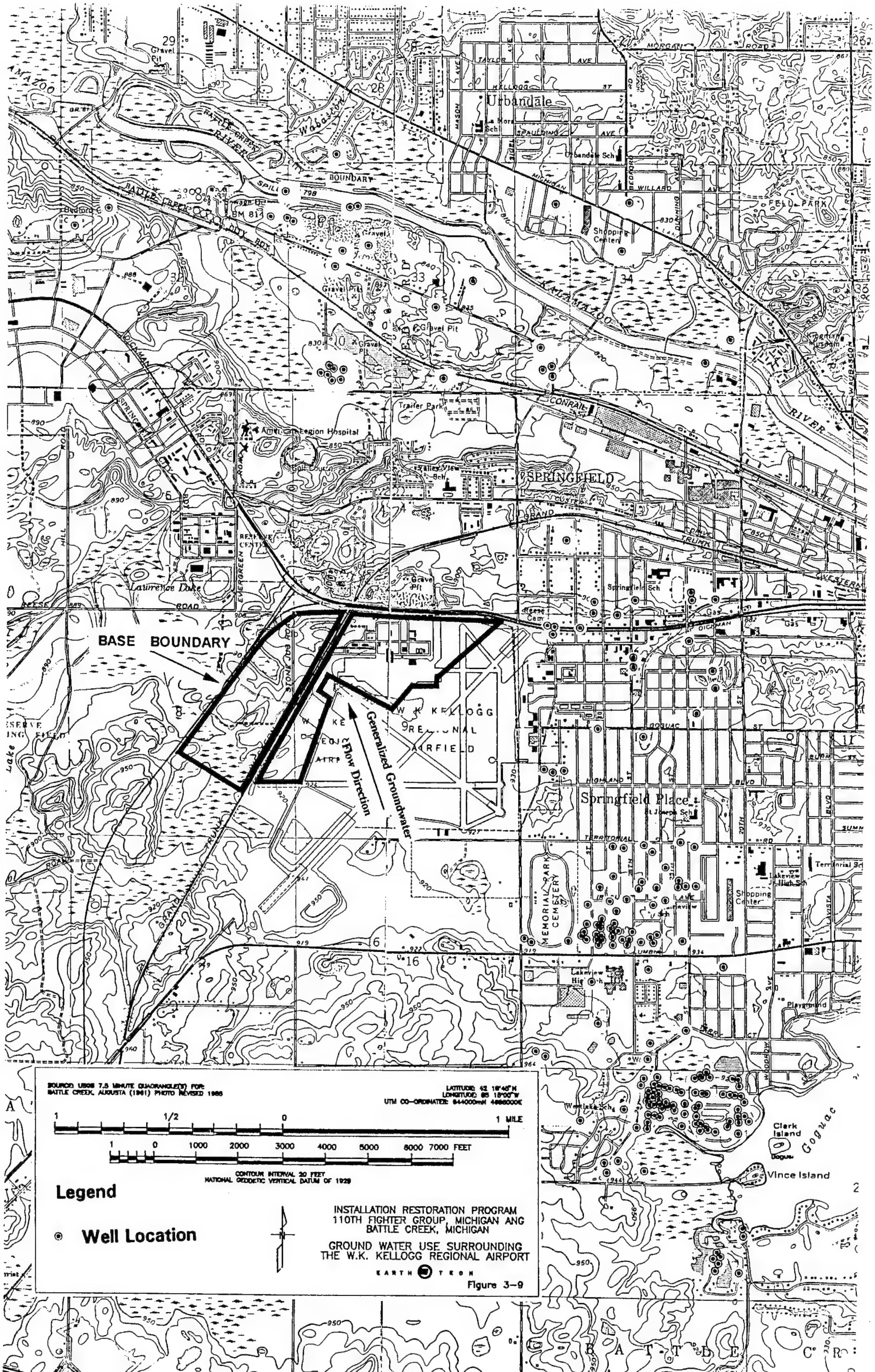
A 160 ft deep well set into the Marshall sandstone aquifer supplied the base's water until 1986. Presently, the base uses water supplied by the city of Battle Creek.

3.6 GROUNDWATER USE

Water well records were obtained from the Calhoun County Department of Public Health for Township 2 South, Range 8 West, Sections 3, 4, 5, 8, 9, 10, 15, 16, 17, 20, 21, and 22 and for Township 1 South, Range 8 East, Sections 32, 33, and 34. The present use status of these wells is unknown. The wells for which records were obtained from the county are presented on Figure 3-9. As shown on this figure, the nearest wells down-gradient (north) of the base are located in Section 33, Township 1S, Range 8E, approximately 1 mile north of the northern base boundary. According to the water well records there are eight wells located in Section 33. Two of these eight wells are completed in bedrock, while the other six wells are reportedly completed in glacial sands and gravels. As is also shown on Figure 3-9, additional wells exist at a radial distance of 1 to 2 miles north of the base, and to the east and southeast (cross-gradient) of the base. According to CDM (June 1992), the private wells sampled north of Dickman Road that were contaminated are no longer used. The residences served by these wells were supplied with municipal water in 1990.

3.7 CRITICAL HABITATS/ENDANGERED OR THREATENED SPECIES

Critical habitats are specific areas that are recognized or managed by federal, state, and/or local governments and/or private organizations as rare, unique, unusually sensitive, or important natural resources. While permanent and seasonal habitats of federally designated endangered species, nature preserves such as federal and state parks, wilderness areas,



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BATTLE CREEK, MICHIGAN

GROUND WATER USE SURROUNDING
THE W.K. KELLOGG REGIONAL AIRPORT

EARTH TECH

Figure 3-9

wildlife sanctuaries, and wetlands are included as critical habitats, parks established solely for historic preservation or recreation are not.

According to the Phase I Records Search (HMTC, 1987), no endangered or threatened species of flora or fauna are located in the vicinity of the base. Low-lying swampy areas exist in the central portion of the area west of the railroad and in an area which forms the southern base boundary to the west of the railroad. These areas, however, are not critical habitats (i.e., unique or unusual natural settings that are necessary for the continued propagation of key species in the ecosystem). More recently, the MDNR has indicated that Nortropis anogenus (Pugnose shiner) and Filipendula rubra (Queen of the Prairie), which are found in the Battle Creek area, are listed as threatened (Personal communication with Thomas Weise, MDNR 1994). However, neither of these have been identified in the vicinity of the base.

Based upon the information shown in United States Geological Survey 7.5-minute series topographic maps of the base and its surrounding areas, no publicly-owned nature preserves, wildlife sanctuaries, or wilderness areas are present within a three mile radius of the base (Radian, July 1994).

4.0 SITE EVALUATION

The results of the PA (completed as part of this investigation) are presented in the following subsections.

4.1 PRELIMINARY ASSESSMENT - OVERVIEW

Seventeen active duty and five retired ANG personnel were contacted during the October 19th through October 21st, 1993 PA/SI kickoff meeting. Additionally, follow-up telephone interviews with six personnel have been performed since the October 1993 interviews. Personnel interviewed are, or were (if retired), associated with the following functions or shops on base:

- Motor Pool
- Operations/Flightline
- Aerospace Ground Equipment
- Pneudraulics
- Fuels Management
- Munitions
- Structural Maintenance/Corrosion Control
- Supply
- Non-Destructive Inspection
- Fire Department
- Photo Lab
- Civil Engineering
- Engine Shop
- Environmental

Records were examined from the environmental coordinators office, as well as from base supply, civil engineering, and the real property office. Outside agencies contacted include the Calhoun County, Michigan, Department of Public Health, Michigan Department of

Transportation (MDOT), and the MDNR. The results of the interviews and records search were used to identify AOC which warranted sampling to confirm or deny the presence of contamination resulting from past waste disposal practices.

4.2 ACTIVITY REVIEW

Several areas on base routinely used or use potentially hazardous or toxic materials. Base personnel reported past or current use of the following materials:

- Oils
- Aviation Gasoline
- JP-4 Jet Fuel
- Diesel Fuel
- Paints
- Methyl Ethyl Ketone
- Paint strippers and thinners
- Trichloroethane (TCE)
- Petroleum Solvent - 661 (PS-661)
- Greases
- Motor Gasoline (leaded and unleaded)
- Hydraulic Fluids
- Heating Oil
- Petroleum Distillate - 680 (PD-680)
- Primers (zinc chromate)
- Methylene chloride
- Trichloroethane (TCA)
- Neutralized battery acid

Table 4-1 provides an estimate of the types and quantities of waste generated by each activity or shop on base, and describes the past and present waste disposal practices for each activity or shop. The operations listed in Section 4.0 have been determined (best-estimate basis) to generate more than 5 gallons/year of waste. If an activity or shop generated less than 5 gallons per year of waste it was not included on Table 4-1.

Table 4-1

Activity Review 110th Fighter Wing, Michigan Air National Guard
W.K. Kellogg Regional Airport, Battle Creek, Michigan

Activity (Location)	Materials Used	Amounts/Year (gals/yr)	Disposal Method/Area and Dates Used[c]
Motor Pool Building 6908 1963 - Present Building 6998 pre-1963	PS-661 Oil Hydraulic Fluid Transmission/brake fluid Paints/thinners Jet fuel Neutralized Battery Acid	150 (gallons/year)[a] 650 (gallons/year)[a] 100[a] (gallons/year)[a] 25[a] (gallons/year)[a] <5[a] (gallons/year)[a] 50[b] (gallons/year)[a] unknown quantities	1963← FTAs/Waste Accumulation Area/OWS →1985 Neutralized and dumped down drain
Pneudraulics Building 6900 1962 - Present Building 6901 pre-1962	Hydraulic Fluid	125 gallons/year[b]	1962← FTAs/Waste Accumulation Area →1985 Small quantities in dumpster
Aerospace Ground Equipment (AGE) Building 6998 1991 - present Building 6901 1977 - 1991 Building 6900 pre-1977	Oil PD-680 Paint Strippers/Removers Hydraulic Fluid/Transmission Fluid	30 gallons/year[a] 420 gallons/year[a] 16 gallons/year[a] 70 gallons/year[a]	1962← FTAs/Waste Accumulation Area →1985
Munitions Building 6929 1994 - present Building 6901 pre-1994	PD-680 Solvents Fuels Naptha Paint	± 5 gal/year Pre-1992[b] ± 70 gal/year Post-1992[b]	1969← FTAs/Waste Accumulation Area →1985 Small quantities in dumpster

t4-1_1.027-April 10, 1996

Table 4-1 (Continued)

Activity Review 110th Fighter Wing, Michigan Air National Guard
W.K. Kellogg Regional Airport Battle Creek, Michigan

Activity (Location)	Materials Used	Amounts/Year	Disposal Method/Area and Dates Used[c]
Structural Maintenance/ Corrosion Control New Hangar 6900 1963 - Present	Naptha PD-680 TCE MEK 60 Paints Paint Strippers/Primers	unspecified quantities unspecified quantities 1 gallon/year[b] 60 gallons/year [a] unspecified quantities 180 gallons/year[b]	1963← FTAs/Waste Accumulation Area →1985 Small quantities in dumpsters
Non-Destructive Inspection New Hangar 6900 1963 - Present	Oil Methylene Chloride TCA	300 gallons/year[b] <5 gallons/year[b] 1 gallon/year[b]	1963← FTAs/Waste Accumulation Area →1985 Small quantities in dumpsters
Operations/Flightline Old/New Hangar (6900/6901) 1950 - present	Oil Hydraulic Fluid PD-680 AvGas/JP-4	70 gallons/year[a] 110 gallons/year[a] 120 gallons/year[a] unspecified quantities	1963← FTAs/Waste Accumulation Area →1985 Small quantities in dumpsters

Source:

(a) Phase I Records Search, 110th Tactical Air Support Wing Michigan Air National Guard (HMTC, 1987)
(b) Developed during this study.
(c) Since 1985 all regulated wastes generated by each shop have been disposed of through the Defense Reutilization and Marketing Office (DRMO).

AVGAS - Aviation gasoline
FTA - Fire Training Area
MEK 60 - Methyl ethyl ketone
OWS - Oil/water separator
PD-680 - Petroleum distillate 680
PS-661 - Petroleum solvent 661
TCA - Trichloroethane
TCE - Trichloroethene

4.3 PAST WASTE DISPOSAL PRACTICES

Since 1985, the potentially toxic or hazardous materials generated by the various shops have been collected and removed from the base by the Defense Reutilization and Marketing Organization (DRMO) which is located at Selfridge ANG Base, Mt. Clemens, Michigan. Prior to 1985, much of the liquid waste generated on the base was collected and used during fire training exercises. The wastes were reportedly collected by the individual shops. One area in particular within the vehicle refueling area was used as a collection point for waste petroleum, oil, and lubricants (POL) and solvents. Smaller amounts of wastes generated in the hangars were reportedly placed in the dumpsters located at Building 6901 or poured on the ground. A review of the past waste disposal practices, by area, is included in the following discussions.

4.4 CONCLUSIONS AND RECOMMENDATIONS FOR SELECTING AREAS OF CONCERN

The remaining portions of Section 4.0 are structured to provide rationale for determining which previous waste disposal areas were to be sampled during the SI phase of the project.

4.4.1 Waste Accumulation Area - Area of Concern A

This area is grass and gravel-covered and is located within the vehicle refueling area immediately east of Building 6910 (Figure 4-1). The area where waste collection occurred is approximately 10 ft wide and 40 ft long. According to base personnel, this facility was used as a waste POL and solvent collection and storage area prior to 1980. One photograph (located in the Civil Engineering (CE) Building) dating from approximately 1980, shows 6 drums located along the northwestern and western corners of the fenced in area. These drums were used to collect waste oils, fuels, and solvents which were generated from the various shops on base. It was reported that some spillage occurred. It is estimated that approximately 20 to 100 gallons of waste accumulated in this area per month and that less

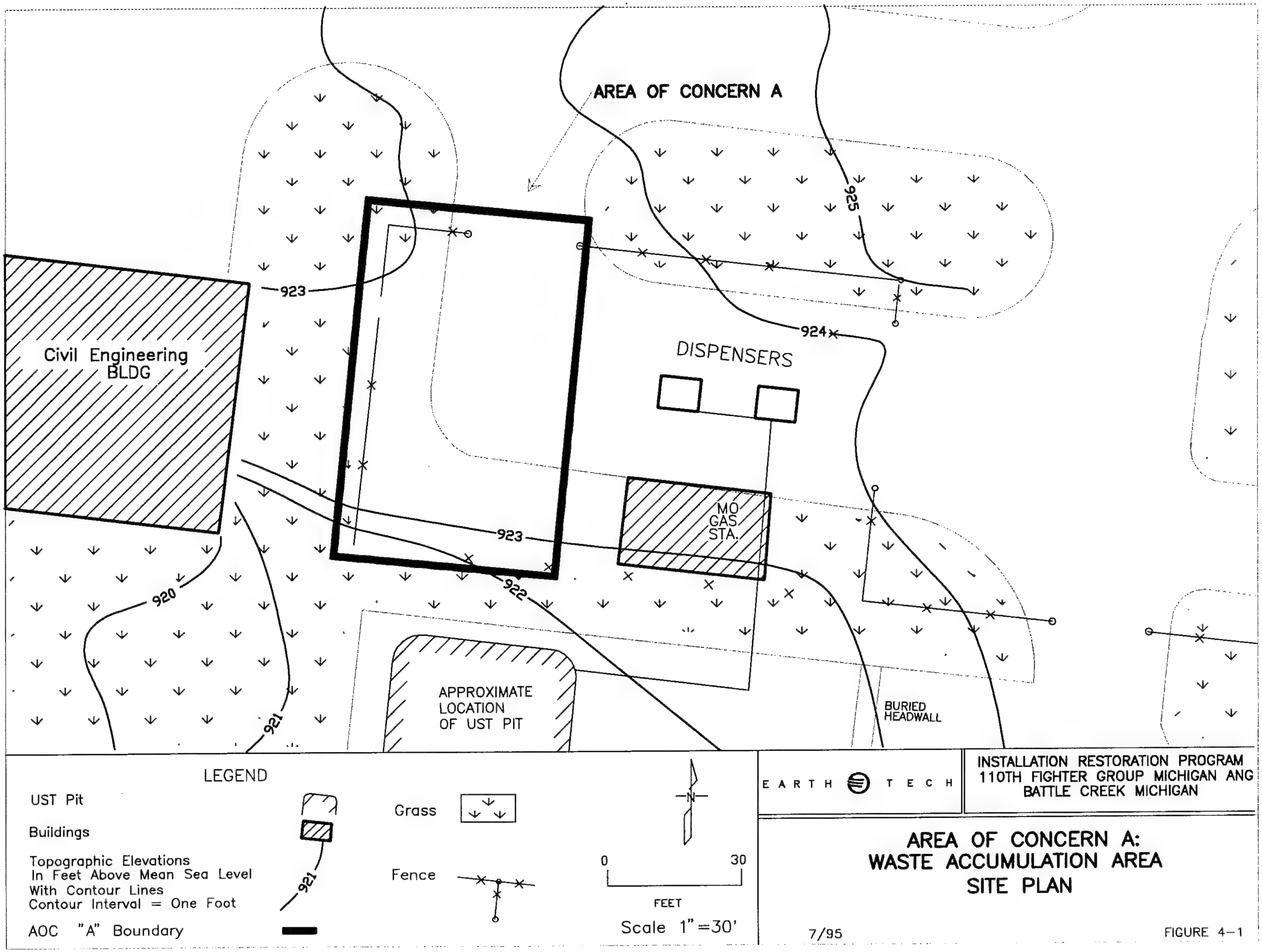


FIG_4-1.dwg 7/95

than 5 gallons of this waste was spilled per month. When full, the barrels were either taken to the fire training area(s) (FTA) and emptied, or removed from the base. Because past spills were reported, this area was recommended for inclusion in the SI.

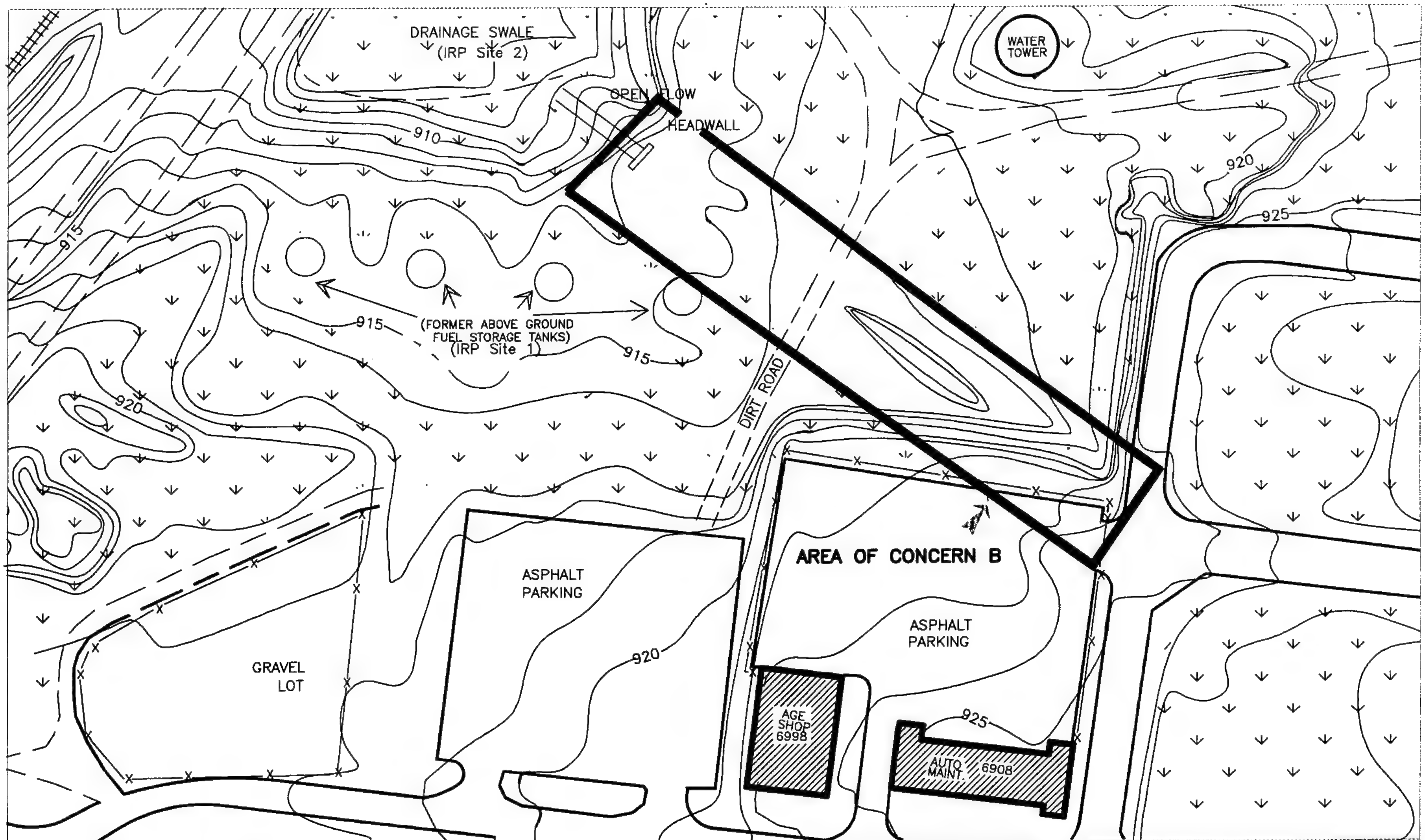
4.4.2 Motor Pool Drainage Ditch - Area of Concern B

Building 6908 which houses the motor pool was constructed in 1963 (Figure 4-2). Routine vehicle maintenance activities (oil changes, etc.) occur in the facility for approximately 100 vehicles. The vehicle types serviced by the Motor Pool range in size from automobiles to 15-ton trucks. The facility is equipped with an oil/water separator (OWS) located beneath the eastern portion of Building 6908.

Reportedly, the OWS was an original part of the motor pool. Prior to 1985, an open ditch ran from the northwest corner of the motor pool parking area to the drainage swale (IRP Site 2). The location of Building 6908 and the surrounding surface drainage features are illustrated in Figure 4-2). In 1985 a storm sewer (concrete pipe) replaced the ditch and the ditch was filled in. From 1963 to 1992, the overflow from the OWS in Building 6908 entered the ditch via a concrete drain. In 1992 the overflow from the OWS was rerouted to the sanitary sewer system.

Base personnel indicated that it was never a common practice to directly dispose of waste POL in the ditch. However, sediment samples collected from the outfall of the old drainage ditch contained VOCs, polynuclear aromatic hydrocarbons (PAHs), and various metals (ES, November 1993). These data suggest that the ditch has, in the past, carried contaminated runoff. In addition, it was reported that stained soils were observed by construction personnel when the storm sewer was installed in the course of the ditch.

Motor pool personnel indicated that a majority of the waste POL generated during maintenance activities was not disposed of through the OWS. The OWS was generally full and reportedly not pumped out regularly. However, during the period of 1972 through 1993 while refueling trucks were being serviced in the motor pool, approximately 50 gallons per



LEGEND

TOPOGRAPHIC ELEVATION IN FEET ABOVE MEAN SEA LEVEL WITH CONTOUR LINES. CONTOUR INTERVAL ONE FOOT — 915

AOC "B" WITH BOUNDARY

GRASS

BUILDING

PAVED ROAD

GRAVEL ROAD

N

0 100
FEET

Scale 1"=100'

EARTH TECH

INSTALLATION RESTORATION PROGRAM
110TH FIGHTER GROUP MICHIGAN ANG
BATTLE CREEK MICHIGAN

AREA OF CONCERN B:
MOTOR POOL DRAINAGE DITCH
SITE PLAN

7/95

FIGURE 4–2

FIG_4–2 7/95

year of JP-4 jet fuel was disposed of through the OWS. Additionally, a variety of operations involving waste POL were conducted in the parking area behind the facility, including the cleaning of engines and vehicles. The parking area was routinely washed and the resulting wastewater flowed into the ditch. Based on the preceding discussions, the former drainage ditch was included in the SI phase of the project.

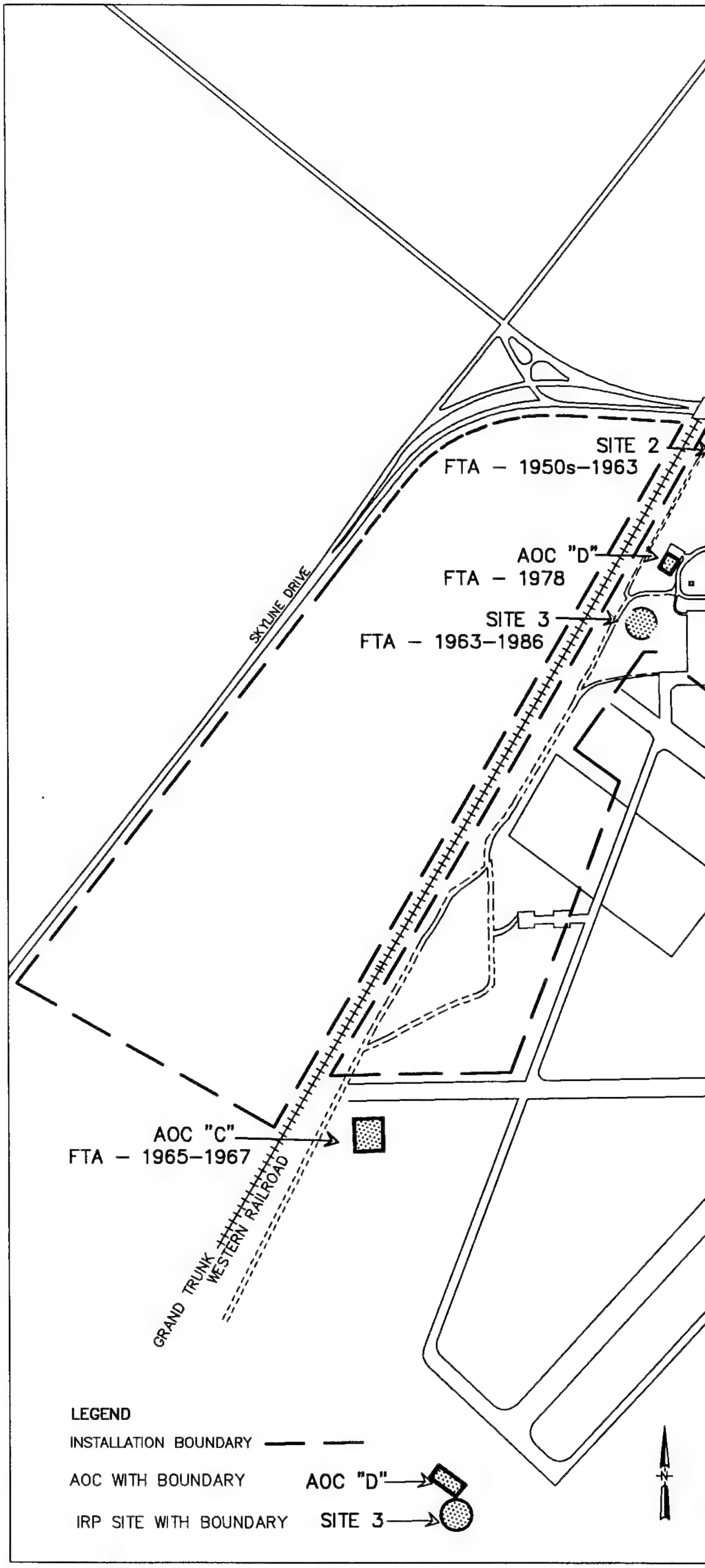
4.4.3 Former Fire Training Areas

A majority of the liquid waste POL and solvents generated on base prior to 1987 were disposed of during fire training activities. A review of the history of base fire training activities and summaries of AOC recommended for SI sampling is included in the following subsections.

4.4.3.1 Fire Training Activity Review

The most recent base FTA is currently included in the IRP as Site 3. Current or former base personnel reported that fire training exercises were conducted at four locations on base. These four areas are illustrated on Figure 4-3. These locations were reportedly active from the 1950s -1986. However, it was also reported that before the arrival of the fire trucks in 1964 very little fire training was completed on base.

Initially (1950s through 1963) fire training exercises were conducted west of the water tower in the drainage swale (IRP Site 2). In 1963 the training pit was established west of the west ramp adjacent to the perimeter road. This is in the same location as the most recently used pit (IRP Site 3). Fire training exercises were conducted at this location from 1963-1986. In 1965 two additional training areas were established south of the east-west runway overrun. These FTAs were used from approximately 1965 to 1967. Reportedly these two FTAs were used sparingly because of their location away from the main portion of the base. These FTAs have been designated AOC C and are described further in Section 4.4.3.2. A final FTA was



EARTH TECH

INSTALLATION RESTORATION PROGRAM
110TH FIGHTER GROUP, MICHIGAN ANG
BATTLE CREEK, MICHIGAN

CHRONOLOGY OF FIRE TRAINING ACTIVITIES

12–94

FIGURE 4–3

FIG_4–3.DWG 7/95

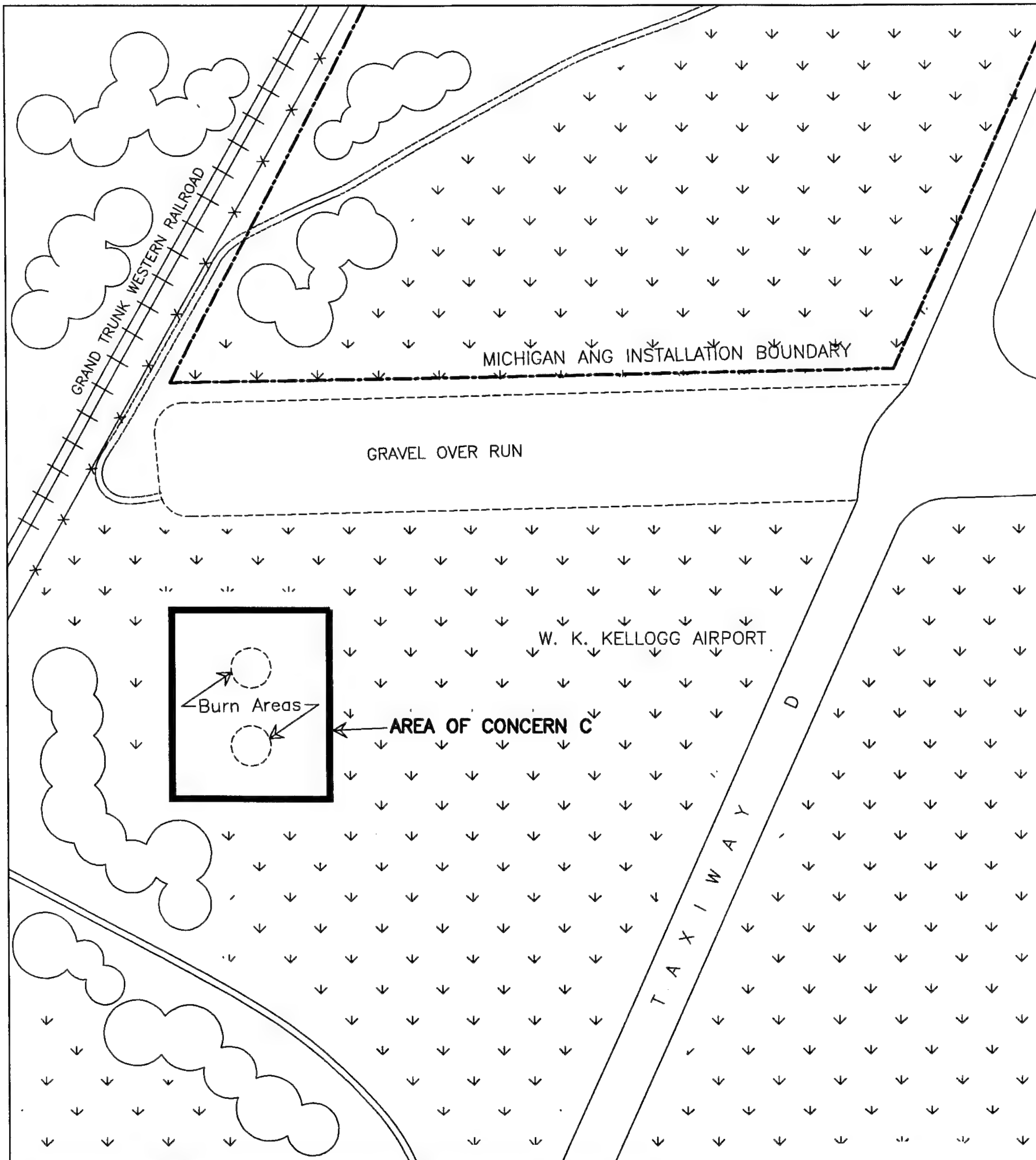
used a few times in 1978 to burn a damaged aircraft prior to its being shipped off-base for disposal. The area is located west of Building 6909. This FTA is located within the boundary of IRP Site 5 and has been designated AOC D. AOC D is described further in Section 4.4.3.3.

Base fire department personnel reported that fire training exercises were conducted four times per year and that approximately three to four individual fires were extinguished per day of training (12 to 16 fires per year). Prior to completing a fire training exercise, a circular, bermed area was constructed on the ground. The area was constructed of native soils and was reportedly unlined. The bermed area was then filled with water and approximately 300 gallons of waste POL, solvents, and JP-4 jet fuel (collected from the shops on base) were floated on top of the water. This mixture was ignited and extinguished. This process was completed three to four times per day (900 to 1,200 gallons of hydrocarbons used per day). The resulting liquid wastes were allowed to evaporate and infiltrate into the soils.

4.4.3.2 Former Fire Training Areas (South) - Area of Concern C

In 1965 two FTAs were established south of the east-west runway overrun (Figure 4-3). These FTAs were used sparingly from approximately 1965 to 1967, because their remote location away from the main portion of the base made access difficult. The location of one of these FTAs was confirmed by a site visit on October 20, 1993. This former FTA contained the remains of at least one aircraft fuselage. A second FTA was reportedly located approximately 60 yards south of the confirmed FTA, but was not confirmed during the October 1993 site visit. The locations of both fire pits were confirmed by inspection of a 1978 aerial photograph obtained from the MDOT. Both locations are presented on Figure 4-4. These AOC are located on airport property, but reportedly were used solely by the ANG.

Because of the age of the fire training pits, no present or former base personnel contacted could accurately recall how often this area was used for fire training exercises. However, if the area was used two times per year for three years (1965, 1966, and 1967) an estimated total of 5,400 to 7,200 gallons (six days at 900 to 1,200 gallons per day) of fuels/solvents were used at AOC C.



LEGEND

- INSTALLATION BOUNDARY
- AOC "C" WITH BOUNDARY
- GRAVEL ROAD
- PAVED ROAD
- RAILROAD
- FENCE
- GRASS
- TREE AREA

0 200

FEET

Scale 1"=200'

EARTH TECH

INSTALLATION RESTORATION PROGRAM
110TH FIGHTER GROUP MICHIGAN ANG
BATTLE CREEK, MICHIGAN

AREA OF CONCERN C:
FIRE TRAINING AREA – SOUTH

7/95

FIGURE 4–4

FIG_4–4.DWG 7/95

4.4.3.3 Former Fire Training Area (West) - Area of Concern D

As stated in Section 4.4.3.1 an FTA was established west of Building 6909 (Figure 4-5) and used a few times in 1978 to burn a damaged aircraft prior to its being shipped off-base for disposal. Photographs of the exercises obtained by the base environmental coordinator place the location of the FTA within the civil engineering outside storage area and within the boundary of IRP Site 5 (Figure 2-2). If the area was used two times, an estimated total of 1,800 to 2,400 gallons (two days at 900 to 1,200 gallons per day) of fuels/solvents were used at AOC D.

4.4.4 Building 6901 (Old Hangar) - Area of Concern E

Prior to construction of the new hangar (Building 6900) in 1962, aircraft maintenance activities were conducted in the old hangar (Building 6901). After construction of the new hangar, some vehicle maintenance activities for the military vehicles assigned to the base were moved into the old hangar. It was reported that vehicles and aircraft parts were painted in the old hangar from 1971 through 1976. It has also been used to wash vehicles. Because of the age of the old hangar, few individuals were able to provide information regarding the past waste handling and disposal practices within the hangar. However, some personnel indicated that small quantities of waste were disposed of by pouring the waste on the ground. A grass-covered area exists on the south side of the hangar between the building and the apron (Figure 4-6). No present or former base personnel indicated that this area was used as a disposal area. As such, an estimate of the amount of waste disposed of in this area cannot be accurately determined. The grassy area may have been a convenient location to dispose of liquid wastes in, and as such, was included in the SI.

4.4.5 Building 6900 (New Hangar) - Area of Concern F

The new hangar (Building 6900- Figure 4-7) was built in 1962 and is currently home to a majority of the aircraft maintenance activities conducted on base. Reported waste disposal methods (prior to 1980) used during maintenance activities in the new hangar consisted of disposing of small quantities of used solvent, paint wastes, and POL in the dumpsters. These

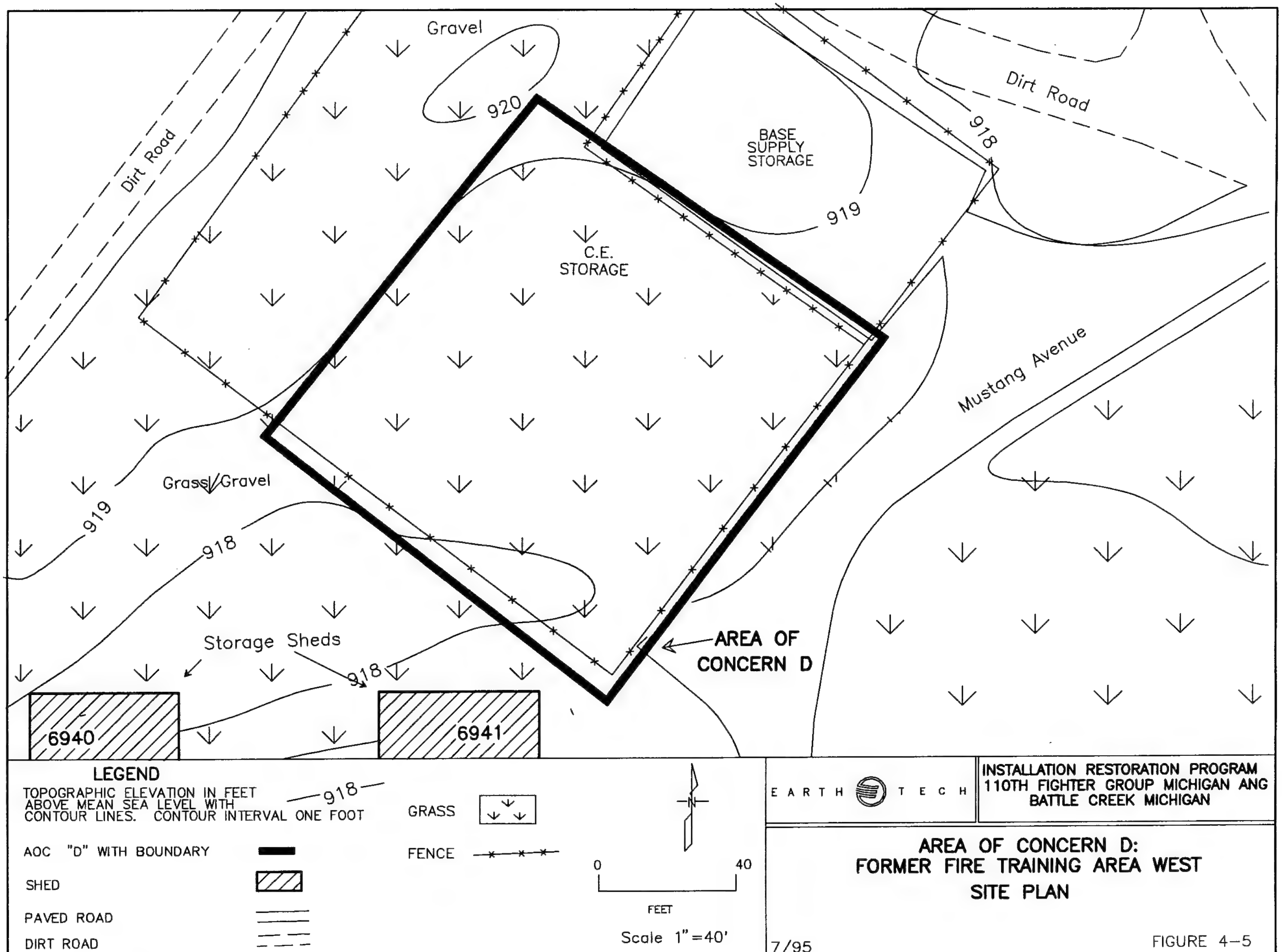
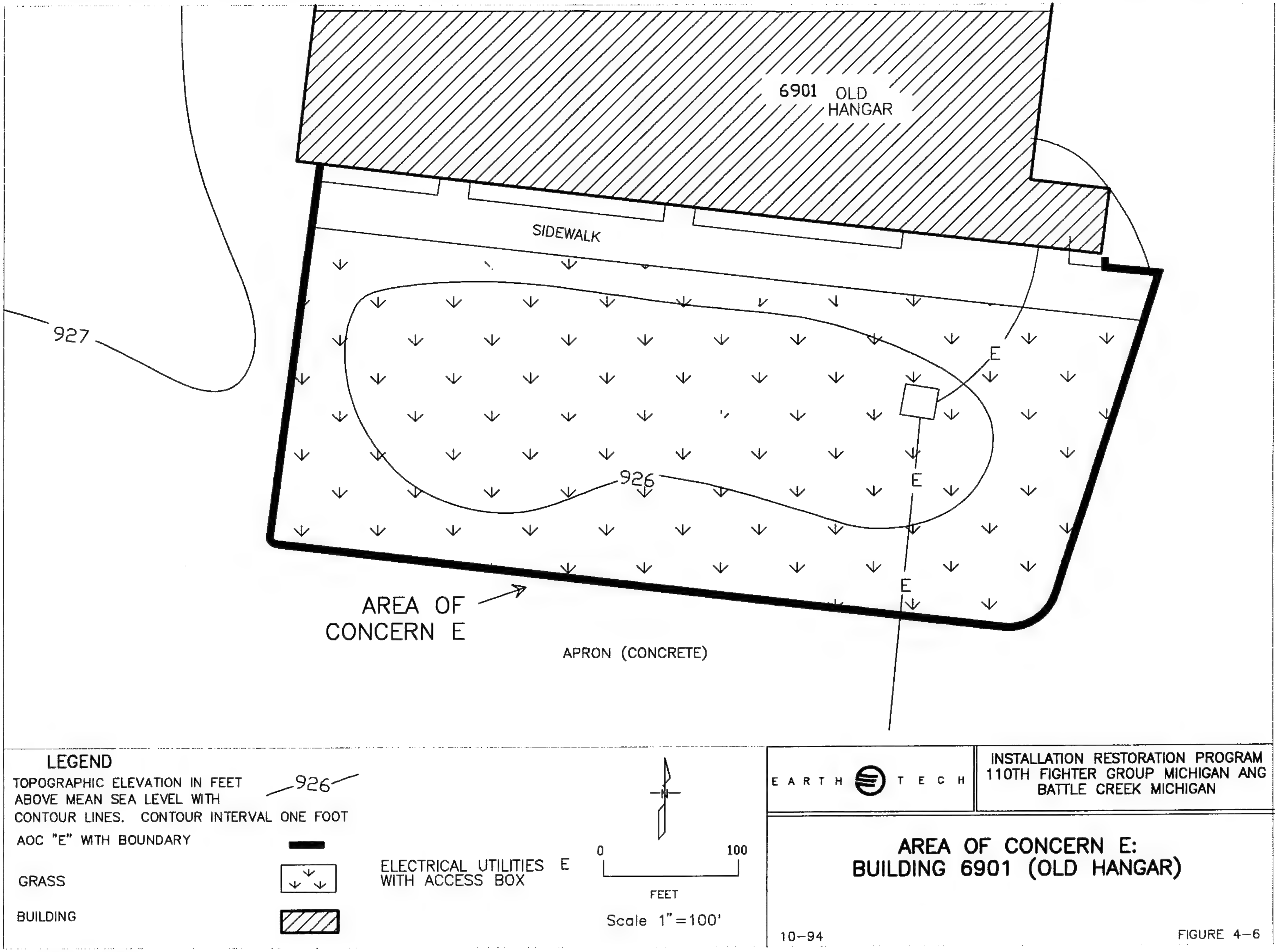


FIG_4-5.dwg 8/95



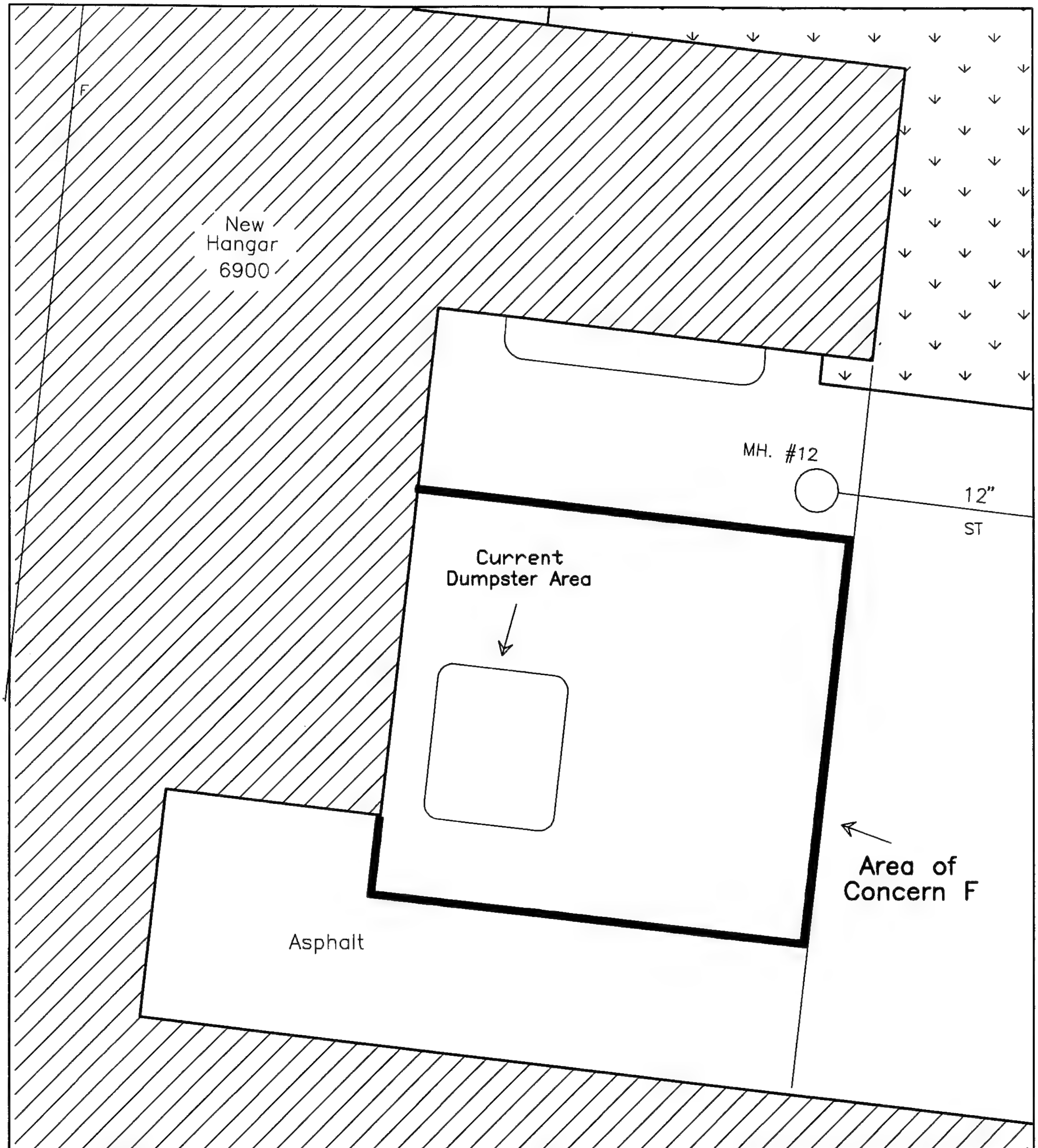
EARTH TECH

INSTALLATION RESTORATION PROGRAM
110TH FIGHTER GROUP MICHIGAN ANG
BATTLE CREEK MICHIGAN

AREA OF CONCERN E:
BUILDING 6901 (OLD HANGAR)

10-94

FIGURE 4-6



LEGEND

Fire Alarm F
Storm Drains ST
Grass
Building
Man Hole with number MH. #12
AOC "F" Boundary

N

0 10
FEET
Scale 1"=10'

EARTH TECH

INSTALLATION RESTORATION PROGRAM
110TH FIGHTER GROUP MICHIGAN ANG
BATTLE CREEK MICHIGAN

AREA OF CONCERN F:
BUILDING 6900 (NEW HANGAR)
SITE PLAN

7/95

FIGURE 4-7

fig_4-7.dwg 7/95

dumpsters were and still are located in an alcove on the northeastern corner of the building (Figure 4-7). Larger quantities were collected and taken to the FTAs to be burned. It was reported that the dumpster area has always been covered by asphalt. However, it was also reported the dumpsters leaked and that the asphalt beneath the dumpsters was frequently in disrepair. Stained soils beneath the dumpsters were also reported by one base employee. The amount of material which may have leaked from the dumpsters is estimated to be less than one gallon per month. The potential exists that waste POL and solvents have entered the soil and/or groundwater from the leaking dumpsters. Based on these data, sampling was completed for AOC F.

4.5 OTHER PERTINENT INFORMATION

Several areas were under consideration for inclusion as AOC, but were removed from further consideration for various reasons. These areas and the rationale for not including them in the SI phase of the project are described in the following subsections.

- Fuels refueling/defueling areas: According to base personnel, aircraft were refueled or defueled in two general areas on base: the area on the apron south of the old base fuels area, and/or the area south of the old hangar where the apron makes a "V". No large fuel spills were reported occurring in these areas, except for the spill associated with IRP Site 6 (Fuel Spill Site). It was reported that numerous small fuel spills (less than approximately five gallons of fuel) occurred in these areas. However, base personnel indicated that spills greater than approximately one gallon of fuel were contained and cleaned up quickly because of the potential fire hazard these spills presented to the aircraft. Additionally, a review of the existing analytical data from previous IRP investigations at Site 6 (ES, November 1993) and from the background monitoring wells installed on the edge of the apron south of the hangars indicate no evidence of groundwater quality problems associated with fuel spills.

- Area West of the Railroad Tracks: In 1986, a tract of 204 acres of land was acquired by the Michigan ANG along the western boundary of the base (Figure 2-2). This land is separated from the main portion of the base by land owned by the Grand Trunk Western Railroad. The original PA (HMTC, 1987) states "several widely scattered fire training burn areas were identified on the new property leased by the ANG". However, interviews with past and present base personnel indicated this area has always been forested, and it has not been used by either the previous owners or by base personnel for any activities involving potentially hazardous materials.

- Truck Ramp: A truck ramp exists north of the base motor pool area. The truck ramp was constructed to allow vehicles to be elevated while a petroleum-based undercoating was applied to the trucks. Reportedly, the undercoating applicator clogged every time it was used and the operation was abandoned after only two or three uses (either in 1983 or 1984). An inspection of the ramp (October 20, 1993) did not reveal the presence of visible buildup of the undercoating on the ramp itself or the presence of stained soils surrounding the ramp.

- Base Storm Sewer Outfall: Based on underground utilities information contained in the Michigan ANG Base Master Plan (Snell Environmental Group, 29 July 1987), surface water flow can be traced for various areas on base. Surface water collected from the main portion of the base drains in a northerly direction to the drainage swale (IRP Site 2), while the tarmac and portions of the hangar drain in a southerly direction to a low area just off the apron. This area roughly corresponds with the fuels refueling/defueling area ("V" in the apron). There is no surface water outlet from this low area. A third area of the base (by the new POL area) is serviced by a storm sewer system that drains south and west. The outfall from this area goes under the Grand Trunk Western Railroad property and in the future will be the permitted storm sewer outfall.

5.0 FIELD PROGRAM

The methods used in the field program will be summarized in the following sections.

5.1 GENERAL APPROACH

The SI field program activities that EARTH TECH implemented at the MIANG, W.K. Kellogg Regional Airport during 1994 are described in this section. These activities included soil gas sampling, the collection of surface and subsurface soil samples, and groundwater sampling. The field program is summarized in Table 5-1.

Table 5-1 Summary of Site Inspection Field Program
110th FW, MIANG, W.K. Kellogg Regional Airport

Screening Samples[a]		AOC A	AOC B	AOC C	AOC D	AOC E	AOC F	Total
	Soil Gas	10	17	22	14	21		83
	Soil	12	18	20	7	12	22	91
	Groundwater			3				3
Totals (screening)		22	35	45	21	33	22	177
Confirmation Activity								
	Soil Borings	2	4	7	2	2	3	20
Confirmation Samples[a]								
	Soil	8	10	12	4	4	7	39
	Groundwater			1				1
Totals (Confirmation)		8	10	11	4	4	7	40

(a) QA/QC samples not included

5.2 FIELD SCREENING SAMPLING AND ANALYSIS

Field screening activities consisted of initial site screening (on-site gas chromatograph [GC]) analysis of soil gas, groundwater, and soil samples that were collected from the confirmation-round soil borings. Target compounds that were screened for during these activities included BTEX and chlorinated aliphatic compounds (cis, and trans-1,2-dichloroethene (DCE), TCE, tetrachloroethane (PCE), and chlorobenzene. CIS-1,2-DCE and TCE coeluted during the analyses. The results are reported as C1S-1,2-DCE/TCE. The screening methods will be discussed in the following sections along with the uses of the various techniques employed in the field program.

5.2.1 Soil Gas Sampling

Soil gas samples were collected from each AOC (except AOC F where no SOV survey was proposed) and analyzed for the presence of chlorinated solvents, BTEX, and total VOCs. Eighty-three soil gas samples were collected and analyzed in the field. Soil gas samples were collected at regular intervals in a fixed grid pattern until the on-site GC results became available. Subsequent sampling locations were relocated, as needed, based on those results.

The sampling probes were constructed of 3 ft lengths of 0.5 inch inside diameter hardened steel. The probe rods were advanced into the soil column using a truck-mounted hydraulic cylinder/percussion hammer unit. Once the soil gas probe was driven to the desired sampling depth, a sampling cap which isolates the interior of the rods from the atmosphere was attached to the lead probe. A length of silicone tubing was then attached to the top of the sampling cap. Finally, the sample line was attached to the vacuum/volume system. Prior to the sampling, a minimum of three purge volumes were evacuated from the rods. Soil gas was obtained using a 5 ml, gas-tight syringe needle which was used to pierce the silicone tubing at the top of the sampling cap and withdraw the soil gas samples. These syringes were delivered to the on-site GC for analysis.

5.2.2 Groundwater Screening

A total of three groundwater samples were collected at AOC C. Using the on-site GC, they were analyzed for the presence of chlorinated solvents, BTEX, and total VOCs. The hydraulic

cylinder/percussion hammer unit was used to advance the probe rods. After the probe rods had intercepted the water table, a section of inert polyethylene tubing was inserted through the probe rods into the groundwater. The aboveground end of the tubing was connected to a peristaltic pump. A groundwater sample was obtained and placed in 40 ml glass vial sealed with a Teflon®-lined septum screw-cap and delivered to the on-site GC for analysis.

5.2.3 Soil Screening

A total of 91 soil samples were collected from AOC A through F and analyzed using the on-site GC during the installation of conformational soil borings. These samples were collected using a 24 inch × 1.375 inch outside diameter piston-type sampling barrel fitted with removable stainless steel liners. Each stainless steel liner consisted of four six inch sections kept in line with a polyvinyl chloride (PVC) sleeve. This configuration is capable, depending upon subsurface conditions, of recovering a core approximately 22 inch long × 1-1/16 inch diameter (320 ml). The assembled sampler was attached to the probing rods and driven and/or pushed to the top of the desired sampling depth. The piston stop pin was removed at this time, and the sampler was driven and/or pushed to the end of the sampling interval. The probe rods were then retracted, and the sampler was recovered. Each sampler was opened upon recovery, and the stainless steel sample liners were removed. The liners were then split apart by hand or with a stainless steel knife. The end of each liner was scanned with a photoionization detector (PID) meter and the reading was recorded on the boring log. A soil sample was extruded from the deepest or lead liner, placed in a 40 ml sample vial, sealed with a Teflon®-lined septum screw-cap, and transported to the field GC for analysis. The second liner was sealed with Teflon® tape and tightly fitting plastic caps for potential laboratory analysis (VOCs). The remaining sample was composited in a stainless steel bowl and placed in an 8 ounce amber jar for potential laboratory analysis (SVOCs and PP metals). The samples were labeled, placed in a cooler, and chilled to 4° C.

5.2.4 Analytical Methods - Field Screening

The soil gas, soil, and groundwater samples collected during the site screening activities were all analyzed for the same target compounds, using the same instrumentation, and using similar methods. This section provides a general description of the analytical instrumentation and target

compounds, as well as a summary of analytical methods specific to the soil gas, soil, and groundwater samples. All analytical results are included in Appendix A.

Instrumentation and Target Compounds

A Sentek Scentograph Plus II™ gas GC equipped with a SP2100 column, an argon ionization detector, an electron capture detector, and a purge and trap sampling system was used for the analysis of screening samples.

For this survey, the target compounds and their method detection limits (MDLs) are as follows:

Compound	MDL (μg/L)
trans-1,2-Dichloroethene(DCE)	34
Benzene	4
cis-1,2-Dichloroethene(DCE)	23
Trichloroethane(TCE)	4
Tetrachlorethane(PCE)	4.7
Toluene	3.7
Chloro/Ethylbenzene	8.2
m,p-Xylene	6.8
o-Xylene	5.6

The MDL is the lowest compound concentration that can be practicably measured using a given analytical method. MDLs were calculated by analyzing seven replicates of a mixed standard with a concentration within ten times the estimated MDL. The concentration for each analyte was determined for each replicate. (A standard deviation was then calculated for the seven standard concentrations multiplied by the Student *t* value for a one-tailed test with a 99% confidence interval.)

A compound's identification was based upon comparison of target compound retention times with sample retention times. Because of the possibility of chromatographic interferences and coelution problems, compounds are considered to be tentatively identified.

Sample quantification was based upon average response factors from continuing calibrations. Response factors were initially calculated using a four-point calibration curve. Due to a problem with temperature stability in the van housing the field GC, however, it was often difficult to obtain a four-point calibration curve. In these cases, a three-point standard curve was used instead. A three-point standard curve is considered to be statistically valid and does not affect the quality of the reported data. In each case, the standards that were prepared consisted of known concentrations of BTEX, chlorobenzene, and 4-bromofluorobenzene in a methanolic solution and known concentrations of cis-1,2-DCE, trans-1,2-DCE, PCE, and TCE in a neat solution. The concentration and identification of target compounds were performed by the integrator and checked by the chemist to ensure that data reduction was performed correctly.

5.2.4.1 Soil Gas Sample Preparation and Analytical Procedures

Soil gas samples were prepared for analysis by injecting 5 ml of soil gas into a prelabeled volatile organic analyte (VOA) vial containing 20 ml of American Society of Testing and Materials (ASTM) Type II water. The sample/water mixture was connected to the purge and trap system, purged for approximately 12 to 15 minutes (purging times were dependent on the measured purge gas flow rates, which were determined periodically during sampling), and run through the GC.

5.2.4.2 Soil Sample Preparation and Analytical Procedures

Soil samples were prepared for analysis by removing 5 grams of soil from the VOA vial and placing this soil in a pre-weighed VOA vial lined with a Teflon® septum. The vial plus soil was weighed and the weight recorded. ASTM Type II water was added to the vial to bring the entire volume of material within the vial to equal 20 ml. The vial plus soil and water was then weighed and the weight recorded. The sample/water mixture was connected to the purge and trap system, purged for approximately 12 to 15 minutes (purging times were dependent on the measured purge gas flow rates, which were determined periodically during sampling), and run through the GC.

5.2.4.3 Groundwater Sample Preparation and Analytical Procedures

Groundwater samples were prepared for analysis by withdrawing 20 ml of groundwater from the VOA vial used to collect the sample and transferring this sample to another precleaned VOA vial. A decontaminated syringe was used to transfer sample from vial to vial. The sample/water mixture was connected to the purge and trap system, purged for approximately 12 to 15 minutes (purging times were dependent on the measured purge gas flow rates, which were determined periodically during sampling), and run through the GC.

5.3 CONFIRMATION SAMPLING AND ANALYSIS

Confirmation sampling activities consisted of the collection and laboratory analysis of selected soil and groundwater samples. Sampling was completed according to HAZWRAP Level B guidelines using protocols established in the Final PA/SI Work Plan (The Earth Technology Corporation, March, 1994). The following sections will describe the methods used to collect and analyze these samples.

5.3.1 Soil Sampling

Thirty-nine confirmation soil samples were submitted to Compuchem Laboratories for analysis of their VOC (Contract Laboratory Program (CLP) 3/90 methods), SVOC (CLP 3/90 method) and PP list metals (CLP methods) content. Confirmation samples were submitted from each of the soil borings completed during the field event. As proposed in the Final PA/SI Work Plan (The Earth Technology Corporation, March, 1994) surface soil samples and soil samples obtained from the zone immediately above the water table, if reached, were submitted from each boring. Gravel layers at some AOC prevented the Geoprobe® from reaching the water table. In these cases, the deepest soil sample obtained prior to refusal was sent to the laboratory. Confirmation soil samples were collected by the methods described in Section 5.2.3.

5.3.2 Groundwater Sampling

One groundwater confirmation sample was collected during the field sampling event. The sample was collected using the methods described in Section 5.2.2 with the following exceptions. Teflon® tubing was substituted for polyethylene tubing during the confirmation groundwater sampling. The Geoprobe® rods were purged using the peristaltic pump. The samples were collected by inserting a check valve on the end of the Teflon® and manually filling the tubing with water. Sample bottles were filled by pulling the tubing from the hole and draining the tubing into the bottles. The confirmation sample was collected and analyzed for VOCs (CLP 3/90 methods), SVOCs (CLP 3/90 methods), and both filtered and unfiltered PP list metals (CLP methods). Filtered metals samples were collected at the end of the sampling. A cartridge filter containing filter membrane with a 0.45μm pore size was attached to the end of the Teflon® tubing. Groundwater was drawn through the Teflon® tubing using the peristaltic pump and collected in the appropriate sample container. The sample containers were labeled and placed on ice for temporary on-site storage.

5.3.3 Analytical Methods - Confirmation Sampling

The numbers of samples collected per AOC and the analysis performed on each sample is included in Table 5-2.

Table 5-2 Confirmation Program Analytical Summary
110th FW, MIANG, W.K. Kellogg Regional Airport

	VOCs (a) (CLP)	SVOCs (a) (CLP)	Metals (a)(b) (CLP)	PCBs (a) (SW 846-8080)	TCLP (c)
AOC A	5	8	8	—	—
AOC B	9	9	9	—	—
AOC C	13/1	13/1	13/2	1	1
AOC D	4	4	4	—	—
AOC E	4	4	4	—	—
AOC F	7	7	7	—	—
Subtotal	42/1	45/1	45/2	1	1
Field Duplicates	4	4	4	—	—
Equipment Rinseates	4	4	4	—	—
Totals	48/1	53/1	53/2	1	1

5.4 DECONTAMINATION

Decontamination procedures for all sampling activities were carried out in general accordance with DOE/HWP-100, SOP 14. Major sampling equipment such as the truck-mounted hydraulic cylinder/percussion hammer was decontaminated prior to beginning work at the base as follows:

- Washed with high pressure steam and laboratory grade detergent.
- Rinsed with potable water.

Decontamination of the major sampling equipment was also completed between sites and at the discretion of the field team leader.

Other sampling equipment such as soil gas probes, sampling barrels, stainless steel mixing bowls, etc., was decontaminated prior to each use as follows:

- Washed with a mixture of potable water and laboratory grade detergent.
- Rinsed with potable water.
- Rinsed with ASTM Type II water.
- Rinsed with pesticide-grade methanol.
- Allowed to air-dry

Because the sample liners were wrapped in PVC they were not rinsed with methanol (Field Change Request 2). Tools that were not to be used immediately were wrapped in aluminum foil. All decontamination fluids were contained during the decontamination process and transferred as required to high capacity polyethylene tanks. The handling and disposition of the waste water generated during the decontamination process is discussed in Section 5.8.

5.5 BACKGROUND

Background soil samples were not collected as part of the SI program implemented by EARTH TECH at the W.K. Kellogg Memorial Airport. The MDNR has established default cleanup criteria for soils

at sites where metals are of concern (State of Michigan MDNR, September 1993). These values are based on the analysis of the database for the Michigan Background Soil Survey (April 1991), which is maintained by the Waste Management Division (WMD). They represent the mean plus one standard deviation for WMD data from combined clay, topsoil, and sand categories. Background is discussed further in Section 6.2.

5.6 DEVIATION FROM WORK PLAN

All deviations from the Final PA/SI Work Plan (The Earth Technology Corporation, March 1994) are considered to be minor. Three field change requests (presented in Appendix B) were submitted by EARTH TECH during the field events.

5.7 SURVEYING

Sampling locations were not surveyed. Samples collected at each of the AOC were tied to a building corner, fence, storm sewer outfall or some other geographic feature on base. The accuracy of the sampling locations presented in Section 6.0 is estimated to be approximately ± two feet.

5.8 INVESTIGATION-DERIVED WASTE MANAGEMENT

Materials which were generated during SI field operations consisted of unused soil samples, decontamination fluid, and miscellaneous solid waste.

Unused soil samples were returned to their respective boreholes. The borehole was then plugged with granular bentonite. The miscellaneous solid waste generated during field activities was containerized and disposed of as nonhazardous material.

Used decontamination fluids were collected in clean polyethylene containers. Wastewater generated during the May 1994 groundwater sampling event was previously stored on base. SI wastewater was combined with this existing wastewater and a composite sample was collected and analyzed for VOCs, SVOCs, and metals using EPA 6000 Series (drinking water) methods. These analytical results were transmitted to the base environmental coordinator and representatives of HAZWRAP and the ANGRC. Copies of the results are included in Appendix C.

6.0 INVESTIGATION RESULTS

The results of the SI program completed at the MIANG, W.K. Kellogg Regional Airport will be discussed in this section. The SI program consisted of soil gas screening, and soil and groundwater sampling and analysis.

The subsections within Section 6.0 will present the data generated by the SI program with a discussion of the findings for each AOC. Each section will address such topics as: sampling locations; screening, confirmational, and QC sampling results; significant findings relating to geologic and hydrogeologic conditions; comparison of concentrations of detected contaminants to ARARs and background levels; and identification of data gaps.

The data interpretations presented in this section are based upon data collected during this investigation and previous investigations, where applicable. Field data, such as boring logs and soil sampling forms, are included in Appendix D. Field VOC analytical results and chromatograms for the soil gas and soil screening are included in Appendix A. The confirmation soil and groundwater analytical results generated during the investigations are printed in their entirety in Appendix E. The data tables included in Section 6.0 present only those compounds and analytes for which a positive response was detected in at least one sample. Per guidance presented in the Final PA/SI Work Plan (The Earth Technology Corporation, March 1994), only limited data validation was completed on the confirmation data set (one in ten samples validated or at least one sample per sample delivery group; field QA samples collected under Level B protocols). Data validation summaries are presented in Appendix F.

6.1 APPLICABLE OR RELEVANT, AND APPROPRIATE REQUIREMENTS

A discussion of the Applicable or Relevant, and Appropriate Requirements (ARARs) for the SI portion of this project are included in the following discussions.

6.1.1 Michigan Environmental Response Act 307 of 1982

The Michigan Environmental Response Act (MERA) 307, enacted in 1982, provided for the identification, risk assessment, and priority evaluation of environmental contamination in the state of Michigan. MERA 307 of 1982 identified three types of cleanup criteria:

- Type A – Background (or method detection limit).
- Type B – Risk-based with standardized residential exposure assumptions.
- Type C – Risk-based with site-specific exposure assumptions.

Legislation passed in 1994 and 1995 has significantly modified the existing MERA 307 regulations regarding the assessment and cleanup of environmental contamination in the state of Michigan.

6.1.2 Michigan Natural Resources and Environmental Protection Act (PA 451)

The Michigan Natural Resources and Environmental Protection Act (NREPA), PA 451, was enacted in 1994. Provisions contained within PA 451 inserted the existing MERA 307 into the newly created NREPA. The pre-existing MERA 307 is now titled Part 201 of the NREPA. On June 5, 1995 House Bill 4596, amending Part 201 of the NREPA, was signed into law. These amendments have substantially modified the provisions of the law regarding liability for the cleanup of environmental contamination (Michigan Department of Natural Resources (MDNR), June 15, 1995). New interim guidance and cleanup standards have been issued by the Environmental Response Division of the MDNR. The major changes to the existing guidance and discussions regarding the new guidance is included in the following subsections.

6.1.2.1 General

The three types of cleanup criteria (Type A, Type B and Type C) which existed under the old MERA 307 have been replaced with four cleanup standard categories:

- residential (formerly Type B criteria)

- commercial (formerly generic Type C criteria)
- recreational
- industrial (formerly generic Type C criteria)

Generic residential, commercial, and industrial, chemical-specific cleanup criteria have been developed by the MDNR using standardized exposure and dose assumptions using algorithms developed under current U.S. Environmental Protection Agency (EPA) guidance. Exposure assumptions have been developed and used to determine acceptable risk levels for carcinogens (one in one hundred thousand, i.e. 10^{-5}) and for non-carcinogens (Hazard Quotient exceeding 1). Interim guidance has been published by the MDNR (Operational Memorandum (O.M.) #8, revision 4, June 5, 1995, and O.M. #14, revision 2, June 6, 1995) which includes chemical-specific cleanup criteria for residential, commercial and industrial exposures. As of July 1995, generic, chemical-specific recreational cleanup criteria were not available from the MDNR. Background concentrations of metals may be substituted as cleanup goals in cases where background is higher than the applicable generic criteria. The default soil values (Type A) contained in O.M. #15 (MDNR, September 30, 1993) may still be applied as state-wide background values.

General discussions regarding the generic industrial, commercial and residential exposure assessments, chemical-specific ARARs, and their applicability to this project are presented in the following subsections.

6.1.2.2 Groundwater

Contaminated Groundwater as a Threat to Human Health

Both health-based and aesthetic groundwater values have been developed for residential and industrial/commercial exposure scenarios. Algorithms used to evaluate the exposure scenarios and develop the chemical-specific values are included in O.M. #8, revision 4 and O.M. #14, revision 2, copies of which are included in Appendix G. Commercial/industrial values were developed assuming that groundwater beneath the facility is used as an on-facility source of drinking water. Inhalation of VOCs released during showering etc., were not evaluated under

these exposure scenarios. However, if no significant inhalation risk exists, criteria and/or exposure control measures which are protective for other routes of exposure are deemed protective for the inhalation pathway.

Contaminated Groundwater as a Threat to Surface Water

Groundwater-surface water interface (GSI) values have been developed by the MDNR and represent the maximum allowable hazardous substance concentration at the groundwater-surface water or the edge of the mixing zone, whichever is applicable for a particular site. GSI values are the same for both residential and commercial/industrial exposure scenarios.

6.1.2.3 Soils

Contaminated Soils as a Threat to Groundwater Quality

Procedures and criteria have been developed by the MDNR to evaluate the potential effects contaminated soils have or might have on groundwater beneath a site. Soil action levels judged to be protective of groundwater can be determined through:

- a comparison of measured soil concentration to 20 times (20x) the appropriate groundwater criterion (background or the health-based or aesthetic drinking water)

- leachate testing (O.M. #12, revision 1, September 1994)

- other methods, such as fate and transport modeling

The 20x values presented for residential exposure scenarios are provided for convenience and are not mandatory if leachate tests or other methods which better represent in situ conditions support the use of a higher value. Commercial/industrial 20x values have not been published.

Contaminated Soil as a Threat to Surface Water

Soil action levels judged to be protective of surface water applying residential exposure scenarios have been determined by MDNR to be 20x the appropriate GSI value. Commercial/industrial 20x values have not been published. However, generic commercial/industrial soil cleanup criteria protective of surface water can be developed using the same approaches that apply to soil criteria protective of groundwater (i.e., leachate testing or modeling).

Contaminated Soil as a Threat to Human Health

Direct contact values have been developed to protect residents or site workers against long-term, systemic health effects from ingestion and dermal absorption of hazardous substances in soil. The exposure assumptions used in the algorithms are discussed in O.M #8, revision 4 and O.M. #14, revision 2. Average, on-site soil concentrations, represented by the 95% upper confidence level (UCL) on the arithmetic mean, may be used to determine compliance with the soil direct contact values. Note that exposures through inhalation of VOCs released from the soils or inhalation of particulate contaminant emissions are excluded from the direct contact values. However, if no significant inhalation risk exists, criteria and/or exposure control measures which are protective for other routes of exposure are deemed protective for the inhalation pathway.

6.1.3 Application of NREPA Cleanup Criteria to the PA/SI

An objective of the SI is to determine which AOC require further analysis or listing as IRP sites. To accomplish this objective soil and groundwater analytical results obtained during the SI were compared to the applicable generic cleanup criteria developed by the MDNR. Only surface and subsurface soils and groundwater (AOC C only) samples were collected during this investigation. Surface water and groundwater surface water interface criteria are not applicable to this investigation because there are no surface water bodies adjacent to the AOC investigated during this SI.

Soil

Information presented in the Internal Draft RI Report (EARTH TECH, June 1995) suggests the base should be considered an industrial facility. Therefore, soil analytical results were compared to the interim chemical-specific, industrial, direct contact criteria prepared by the MDNR. Background soils metals concentrations, developed during the RI, were also incorporated into this evaluation.

In addition to evaluating the direct contact pathway, the soils were directly compared to the residential 20x drinking water value as a way of screening for constituents which may be susceptible to leaching from the soils and adversely affecting groundwater. Because groundwater flows off-base, to areas of Battle Creek which may in the future be residential areas, groundwater results were evaluated against these residential cleanup criteria.

Soil Protective of Groundwater

Following guidance developed by the MDNR soils are judged protective of groundwater if total chemical concentrations contained within the soils are below the 20x health-based drinking water values (for organics) or the higher of:

- site-specific or default background concentrations
- 20x the applicable health-based or aesthetic drinking water concentrations

Table 6-1 presents background concentrations for surface and subsurface soils and groundwater which were developed during the RI. Table 6-2 lists the three evaluation criteria used to develop soil protective of groundwater values for metals. As stated previously, the soil protective of groundwater value is the higher of background or 20x the applicable residential health-based or aesthetic drinking water criteria. 20x the groundwater background concentrations may be substituted in place of the health-based or drinking water concentrations if background concentrations are higher than the health-based concentrations. The soil protective of groundwater values reproduced on this table are not mandatory cleanup

Table 6-1
Background Surface and Subsurface Soil and Groundwater Concentrations
110th FW, MIANG, Battle Creek, Michigan

	MEAN	Standard Deviation (STD)	Background Concentration (MEAN + 3 STD)	CV[a]	Type A Value [d]	Background[e]
Background Surface Soils						
Antimony [b]	0.13	0.04	0.25	0.32	--	0.25
Arsenic	3.39	1.25	7.14	0.37	5.8	7.14
Barium	33.73	14.23	76.43	0.42	75	76.43
Beryllium	0.17	0.01	0.19	0.06	--	0.19
Cadmium [c]	(0.05 U)	--	--	--	1.2	1.2
Chromium	7.65	3.82	19.10	0.50	18	19.10
Copper	4.30	1.22	7.96	0.28	32	32
Lead	6.78	3.28	16.61	0.48	21	21
Mercury [c]	(0.1 U)	--	--	--	0.13	0.13
Nickel	5.66	1.92	11.43	0.34	20	20
Selenium	0.29	0.10	0.59	0.34	0.41	0.59
Silver [c]	(0.5 U)	--	--	--	1.0	1.0
Thallium	0.30	0.11	0.62	0.36	--	0.62
Zinc	14.80	4.83	29.30	0.33	47	47
Background Subsurface Soils						
Antimony [b]	0.14	0.07	0.36	0.5	--	0.36
Arsenic	3.23	1.11	6.57	0.34	5.8	6.57
Barium	6.90	1.15	10.36	0.17	75	75
Beryllium [b]	0.05	0.01	0.08	0.19	--	0.08
Cadmium [c]	(0.05 U)	--	--	--	1.2	1.2
Chromium	4.38	0.75	6.63	0.17	18	18
Copper	3.85	0.17	4.37	0.04	32	32
Lead	2.58	0.36	3.65	0.14	21	21
Mercury [c]	(0.1 U)	--	--	--	0.13	0.13
Nickel	4.70	0.61	6.52	0.13	20	20
Selenium [c]	(0.47 U)	--	--	--	0.41	0.41
Silver [c]	(0.5 U)	--	--	--	1.0	1
Thallium	0.19	0.09	0.45	0.47	0.45	0.45
Zinc	11.75	3.90	23.45	0.33	47	47
Background Groundwater						
Aluminum	62.2	--	--	--	--	62.2
Antimony	18.2	--	--	--	--	18.2
Arsenic	1.3	--	--	--	--	1.3
Barium	51.2	--	--	--	--	51.2
Beryllium	0.2	--	--	--	--	0.2
Cadmium	1.8	--	--	--	--	1.8
Calcium	73850.0	--	--	--	--	73850.0
Chromium	2.6	--	--	--	--	2.6
Cobalt	3.1	--	--	--	--	3.1
Copper	5.0	--	--	--	--	5.0
Iron	356.0	--	--	--	--	356.0
Lead	2.2	--	--	--	--	2.2
Magnesium	14972.5	--	--	--	--	14972.5
Manganese	807.3	--	--	--	--	807.3
Mercury	0.1	--	--	--	--	0.1
Nickel	9.2	--	--	--	--	9.2
Potassium	1839.9	--	--	--	--	1839.9
Selenium	1.8	--	--	--	--	1.8
Silver	2.2	--	--	--	--	2.2
Sodium	10217.5	--	--	--	--	10217.5
Thallium	1.3	--	--	--	--	1.3
Vanadium	1.6	--	--	--	--	1.6
Zinc	5.9	--	--	--	--	5.9

soil results are presented in mg/kg
groundwater results are presented in $\mu g/\ell$
(a) CV = coefficient of variation test; test must produce a value below 0.5 to be statistically valid for granular soils, (MDNR, April 1994).
(b) Some data were rejected resulting in a data set of insufficient size to develop a background.
(c) Element was not detected in the background samples.
(d) Type A default values MERA Operational Memorandum #15 (MDNR, Sept 30, 1993)
(e) Highest of Mean + 3 STD or Type A default value.

Table 6-2
Soil Values Protective of Groundwater - Metals
110th FW, MIANG, Battle Creek, Michigan

	SURFACE SOIL				SUBSURFACE SOIL			
	Background (a)	20xDW (b)	20x Background (c)	Soil Protective of Groundwater Value (d)	Background (a)	Residential (b)	20x Groundwater (c)	Soil Protective of Groundwater Value (d)
Antimony	0.25	0.12	0.36	0.36	0.36	0.12	0.36	0.36
Arsenic	7.14	1.0	0.026	7.14	6.57	1.0	0.026	6.57
Barium	76.43	40	1.02	76.43	75	40	1.02	75
Beryllium	0.19	0.08	0.004	0.19	0.08	0.08	0.004	0.08
Cadmium	1.2	0.10	0.036	1.2	1.2	0.1	0.036	1.2
Chromium	19.10	2	0.052	19.10	18	2	0.052	18
Copper	32	20	0.10	32	32	20	0.10	32
Lead	21	0.08	0.044	21	21	0.08	0.044	21
Mercury	0.13	0.04	0.002	0.13	0.13	0.04	0.002	0.13
Nickel	20	2	0.184	20	20	2	0.184	20
Selenium	0.59	1.0	0.036	1.0	0.41	1.0	0.036	1.0
Silver	1.0	0.68	0.044	1.0	1	0.68	0.044	1.0
Thallium	0.62	0.040	0.026	0.62	0.45	0.040	0.026	0.45
Zinc	47	48	0.118	48	47	48	0.118	48

all concentrations are presented in mg/kg

(a) Background surface and subsurface soil concentrations were obtained from Table 6-1
(b) From MDNR O.M. #8, Revision 4
(c) Groundwater background concentrations were obtained from Table 6-1 and multiplied by 20. This results in a value in units of mg/ℓ which was converted to mg/kg by dividing by 1000 and assuming the density of water is 1000g/kg

Site-specific
(d) Soil Protective of groundwater value is the greatest of the soil background (Column 1), 20x residential health-based drinking water value (Column 2), or 20x site-specific groundwater (Column 3)

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criteria. Leachate testing or other methods which better represent in situ conditions can be used to support the use of higher levels or no further action. All soil analytical tables presented in this report contain two criteria; the generic industrial direct contact value and the soil protective of groundwater value obtained from Table 6-2.

Groundwater

Because groundwater flows off-base, to areas of Battle Creek which may in the future be residential areas, the groundwater samples collected at AOC C will be compared to the interim residential health-based and aesthetic drinking water values. Background groundwater metals concentrations, developed during the RI, will be incorporated where applicable, into this evaluation.

6.2 AREA OF CONCERN A - WASTE ACCUMULATION AREA

The field activities consisted of a soil gas survey (ten samples; eight locations identified as SG1 through SG8) followed by collection and analysis of surface and subsurface soil samples from borings ASB1 and ASB2. Total depths and the screening and confirmation sampling intervals for the AOC A borings are presented in the following table.

Boring Number	Total Depth (feet bgs)	Field Screen Sample Intervals	Confirmation Sample Intervals
ASB1	27	0-1, 5-7, 10-12, 15-17, 20-22, and 25-27	0-1, 5-7, and 25-27
ASB2	32	5-7,10-12, 15-17, 20-22, 25-27 and 30-32	0-2 and 25-27

These activities were completed during July 1994. Additional surface soil samples (ASS01 through ASS03) were collected and analyzed during November 1994. All of these sampling locations are presented on Figure 6-1. The results of these activities are presented in the following subsections.

6.2.1 Geology and Hydrogeology

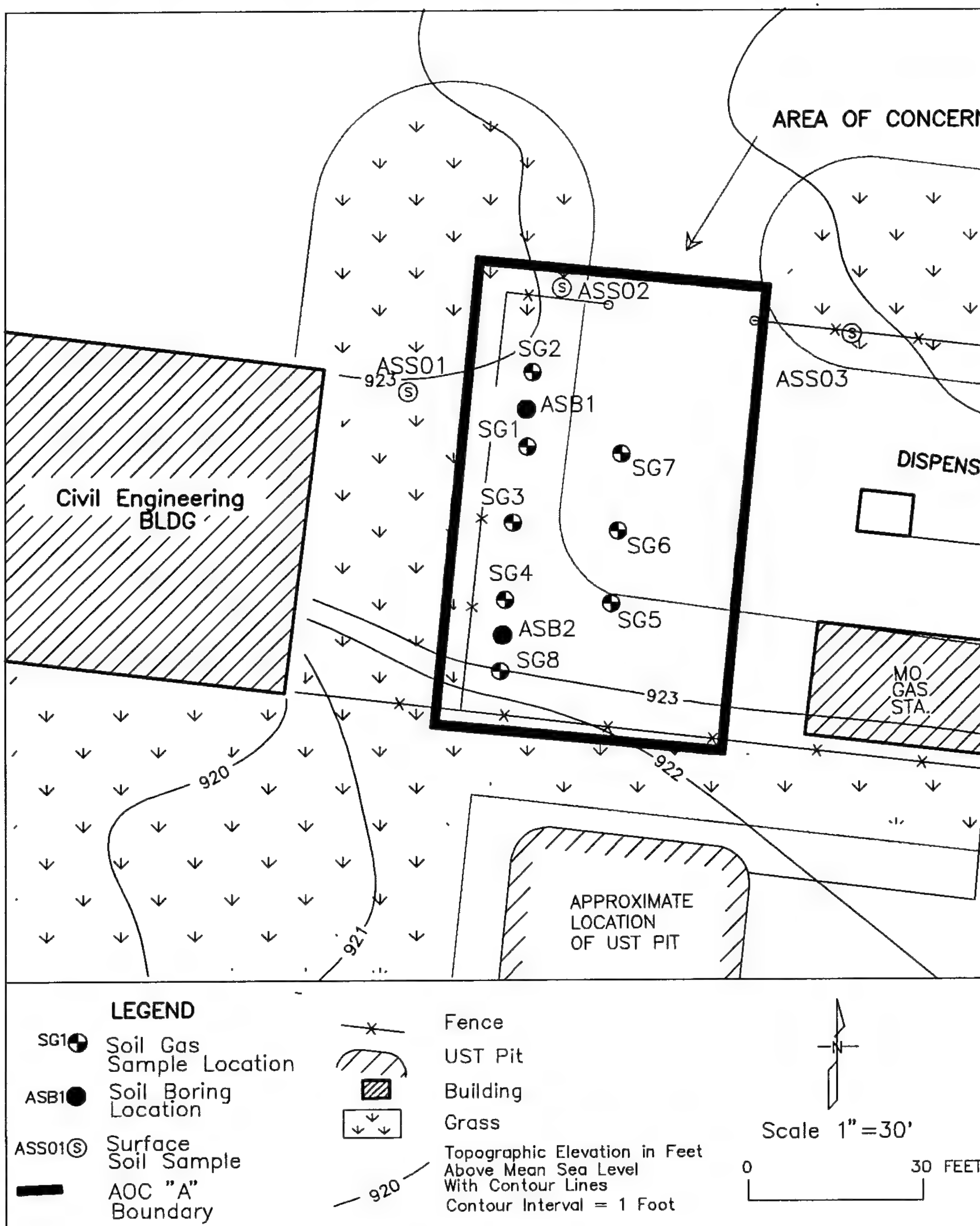
The soils beneath AOC A were described in the field as being composed of brown to yellowish-brown, well-sorted, fine-grained sand. Wet sands, indicating saturated conditions were encountered in the 30 to 32 ft sample interval obtained from boring ASB2. Groundwater flow is to the northwest beneath AOC A (Figure 3-7).

6.2.2 Results of AOC A Screening Activities

The results of the soil gas and soil screening activities for AOC A are included in the following subsections.

6.2.2.1 Soil Gas Survey

The initial screening activities at AOC A consisted of collection and on-site analysis of ten soil gas samples. Location ASG1 was sampled initially and was vertically profiled. Samples ASG1a, b, and c were collected at depths of 5, 10, and 20 ft, respectively. No target compounds or total VOCs were reported in these three samples. The remainder of the soil gas survey at AOC A was completed at the 5 ft depth interval. No target compounds or total VOCs were reported in the remainder of the SOV survey. Because the results of the SOV survey were negative, borings ASB1 and ASB2 were located in the general area where photographs and personnel interviews indicated the waste oil drums were stored (Section 4.0).



EARTH TECH

INSTALLATION RESTORATION PROGRAM
110TH FIGHTER GROUP MICHIGAN ANG
BATTLE CREEK MICHIGAN

**AREA OF CONCERN A:
WASTE ACCUMULATION AREA
SAMPLE LOCATIONS**

9/95

FIGURE 6-1

FIG_6-1.dwg 8/95

6.2.2.2 Soil Screening

Soil samples were collected from borings ASB1 and ASB2 at the surface and at 5 ft intervals until the water table was encountered. A total of 12 soil samples were obtained from these borings and analyzed for their VOC content using the on-site GC. Faint to possible hydrocarbon odors were detected and recorded by the field team during the collection of samples numbered BCA-B1-0001 and BCA-B1-0507. No target compounds or total VOCs were reported from the on-site analysis of these samples, or from any of the other AOC A soil samples.

6.2.3 AOC A - Soil Analytical Results

A discussion of the analytical results obtained for the surface and subsurface soils are included in the following sections.

6.2.3.1 Surface Soil

Five surface soil samples were collected from AOC A. The surface soil analytical results for AOC A are presented in Table 6-3, and are discussed by compound or analyte lists (VOCs, SVOCs, and metals) in the following subsections.

VOCs

VOCs were only analyzed for at locations ASB1 and ASB2. Only the common laboratory contaminants acetone (18 to 33 μg/kg) and methylene chloride (7 to 53 μg/kg) were detected in the four samples collected and analyzed from AOC A. Neither compound was detected in a concentration greater than the generic industrial direct contact or soil protective of groundwater values.

TABLE 6-3 AREA OF CONCERN A: WASTE ACCUMULATION AREA SURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		ASB1*		ASB1		ASB2		ASB2	
SAMPLE ID:		BCA-B1-0001		BCG-B1-0001		BCA-B2-0002		BCG-B2-0002	
COLLECTION DATE:		06/30/94		06/30/94		07/14/94		07/14/94	
ASSOCIATED FIELD QC:		BCER4		BCER4		BCER4		BCER4	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP VOA ($\mu g/kg$)									
Acetone	7.4E+7/15,000	33	B	11	U	11	U	18	
Methylene chloride	3.3E+6/100	20	B	53	B	7	JB	8	JB
CLP SVOA ($\mu g/kg$)									
2-Methylnaphthalene	ID/ID	180	()	3800	U	340	U	340	U
Acenaphthene	8.1E+8/26,000	340	()	3800	U	340	U	340	U
Acenaphthylene	1.6E+7/520	330	()	3800	U	340	U	340	U
Anthracene	1.0E+9/1.5E+5	920		820	J	340	U	340	U
Benzo(a)anthracene	2.1E+5/--	4800	D	5200		42	J	340	U
Benzo(a)pyrene	21,000/--	4300	D	4600		340	U	340	U
Benzo(b)fluoranthene	2.1E+5/--	6800	D	9200		72	XJ	340	U
Benzo(g,h,i)perylene	1.6E+7/--	2300		5000		340	U	340	U
Benzo(k)fluoranthene	2.1E+6/--	10000	D	9700		77	XJ	340	U
Carbazole	--/--	720		890	J	340	U	340	U
Chrysene	2.1E+7/--	4000	D	4400		36	J	340	U
Di-n-butyl phthalate	5.4E+8/18,000	93	()	3800	U	260	J	160	J
Dibenzo(a,h)anthracene	21,000/--	510		1100	J	340	U	340	U
Dibenzofuran	ID/ID	270	()	3800	U	340	U	340	U
Fluoranthene	5.4E+8/18,000	9500	D	11000		97	J	340	U
Fluorene	5.4E+8/18,000	520		420	J	340	U	340	U
Indeno(1,2,3-cd)pyrene	2.1E+5/--	2400		4500		340	U	340	U
Naphthalene	1.6E+8/5,200	170	()	3800	U	340	U	340	U
Phenanthrene	1.6E+7/520	5500	D	6100		59	J	340	U
Pyrene	3.4E+8/11,000	7200	D	7500		66	J	340	U
bis(2-Ethylhexyl)phthalate	1.1E+7/--	280	(B)	3800	U	85	J	47	J
CLP METAL (mg/kg)									
Antimony	1,600/0.36	3.40	UL	3.40	UN	3.50	*	3.30	*
Arsenic	83/7.14	39.60		7.70	N	8.70	N	10.10	N
Beryllium	35/0.19	0.28	()	0.20	B	0.12	U	0.13	B
Cadmium	2.3E+3/1.2	0.49	(L)	0.44	BN	0.36	U	0.36	U
Chromium	1.0E+6/19.10	23	L	11.50	N	6.50	*	7	*

BCA-B1-0001, BCG-B1-0001, BCA-B2-0002, and BCG-B2-0002 are field duplicates
1.0E+3 is abbreviated scientific notation and is equivalent to 1,000

mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
$\mu g/kg$ micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
D Sample result is from a dilution
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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TABLE 6-3 AREA OF CONCERN A: WASTE ACCUMULATION AREA SURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		ASB1*		ASB1		ASB2		ASB2	
SAMPLE ID:		BCA-B1-0001		BCG-B1-0001		BCA-B2-0002		BCG-B2-0002	
COLLECTION DATE:		06/30/94		06/30/94		07/14/94		07/14/94	
ASSOCIATED FIELD QC:		BCER4		BCER4		BCER4		BCER4	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP METAL (mg/kg)									
Chromium, Cr+6 (mg/ℓ)	2.2E+4/--	0	U	0	U	0	U	0.01	
Copper	1.7E+5/32	8.20		11.10		4.80		6.20	
Lead	4.0E+2/21	124		43.80		3.80	N	2.20	N
Nickel	3.4E+5/20	8.70		10.80		5.70	*	8.40	*
Zinc	1.0E+6/48	75	L	131	EN	15	E	17.40	E

BCA-B1-0001, BCG-B1-0001, BCA-B2-0002, and BCG-B2-0002 are field duplicates
1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
µg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
D Sample result is from a dilution
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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TABLE 6-3 AREA OF CONCERN A: WASTE ACCUMULATION AREA SURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		ASS01		ASS02		ASS03	
SAMPLE ID:		BCA-SS01		BCA-SS02		BCA-SS03	
COLLECTION DATE:		11/10/94		11/10/94		11/10/94	
	PA451 PART 201 CRITERIA [b]	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP SVOC (μg/kg)							
2-Methylnaphthalene	ID/ID	46	J	110	J	150	J
Acenaphthene	8.1E+8/26,000	160	J	330	J	660	
Acenaphthylene	1.6E+7/520	370	U	41	J	53	J
Anthracene	1.0E+9/1.5E+5	230	J	470		700	
Benzo(a)anthracene	2.1E+5/--	1700		2800		3700	D
Benzo(a)pyrene	21,000/--	1700		2300		2800	
Benzo(b)fluoranthene	2.1E+5/--	4800	DX	5800	DX	6900	DX
Benzo(g,h,i)perylene	1.6E+7/--	920		1500		1600	
Benzo(k)fluoranthene	2.1E+6/--	5200	DX	5900	DX	7000	DX
Butyl benzyl phthalate	7.2E+8/24,000	65	J	380	U	390	U
Carbazole	--/--	210	J	440		880	
Chrysene	2.1E+7/--	1800		2600		4400	D
Di-n-butyl phthalate	5.4E+8/18,000	370	U	71	J	68	J
Dibenzo(a,h)anthracene	21,000/--	200	J	290	J	510	
Dibenzofuran	ID/ID	84	J	190	J	370	J
Fluoranthene	5.4E+8/18,000	2500		5600	D	7300	D
Fluorene	5.4E+8/18,000	160	J	330	J	520	
Indeno(1,2,3-cd)pyrene	2.1E+5/--	880		1500		1600	
Naphthalene	1.6E+8/5,200	48	J	180	J	450	
Phenanthrene	1.6E+7/520	1600		2800		5700	D
Pyrene	3.4E+8/11,000	2400		4800	D	6800	D
bis(2-Ethylhexyl)phthalate	1.1E+7/--	370	U	380	U	390	U
CLP METAL (mg/kg)							
Antimony	1,600/0.36	10.70	UN	11.50	UN	12.10	UN
Arsenic	83/7.14	9	N	13.80	N	6.50	N
Barium	3.2E+5/76.43	37.30	B	76.70		53.50	

BCA-B1-0001, BCG-B1-0001, BCA-B2-0002, and BCG-B2-0002 are field duplicates
1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
μg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
D Sample result is from a dilution
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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TABLE 6-3 AREA OF CONCERN A: WASTE ACCUMULATION AREA SURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		ASS01		ASS02		ASS03	
SAMPLE ID:		BCA-SS01		BCA-SS02		BCA-SS03	
COLLECTION DATE:		11/10/94		11/10/94		11/10/94	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP METAL (mg/kg)							
Beryllium	35/0.19	0.26	B	0.50	B	0.37	B
Cadmium	2.3E+3/1.2	0.90	U	0.98	U	1	U
Chromium	1.0E+6/19.10	12	*	10.80	*	10	*
Copper	1.7E+5/32	8.80	*	10.50	*	8.20	*
Lead	4.0E+2/21	51.60		62		46.90	
Mercury	1.4E+3/0.13	0.11	U	0.12	U	0.12	U
Nickel	3.4E+5/20	9.20		10.50		8.70	B
Zinc	1.0E+6/48	58.20	*	53.80	*	40.40	*

BCA-B1-0001, BCG-B1-0001, BCA-B2-0002, and BCG-B2-0002 are field duplicates
1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
μg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
D Sample result is from a dilution
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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SVOCs

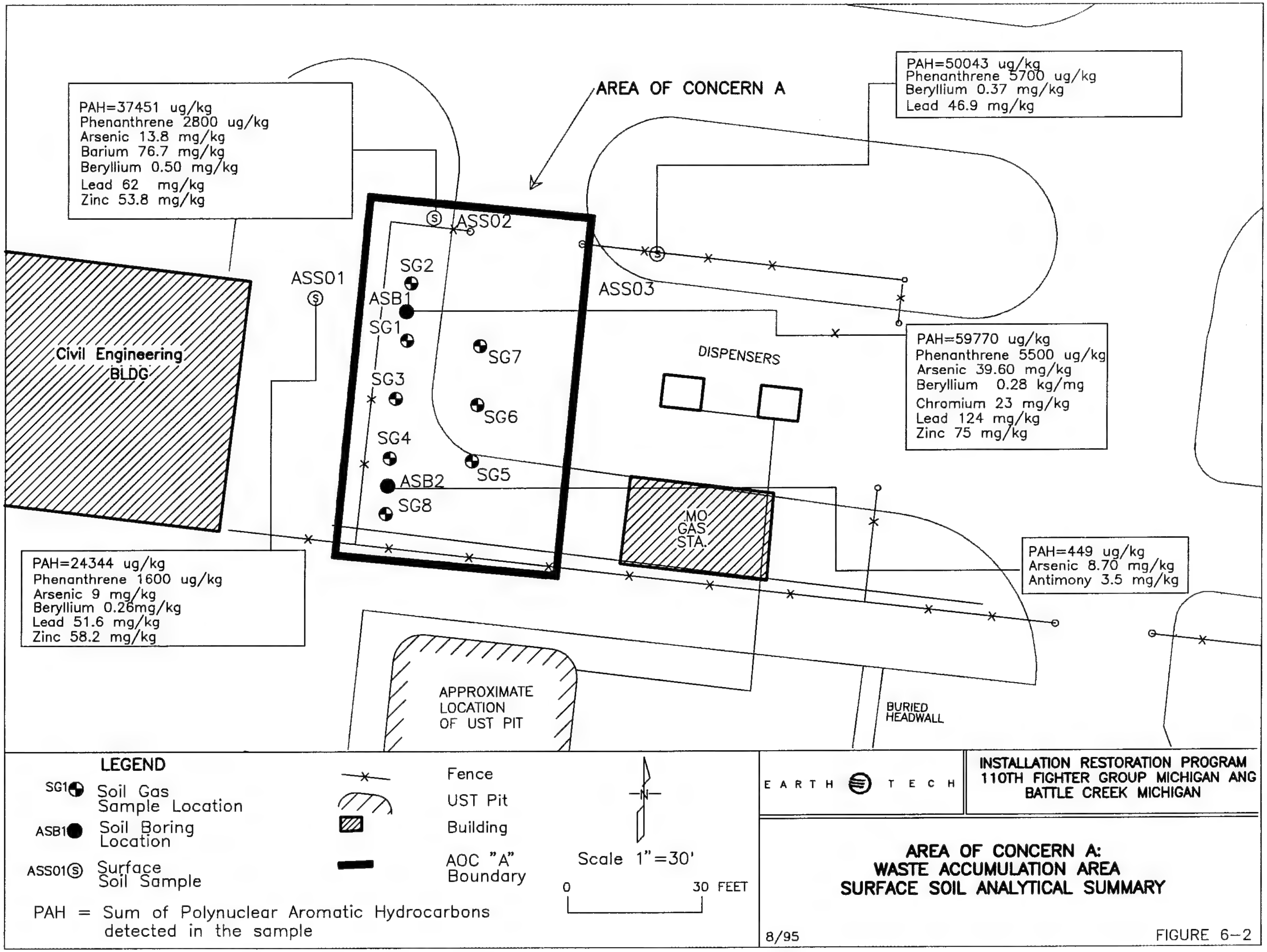
Twenty-two individual SVOCs were detected in the five surface soil samples, including compounds from the PAHs and phthalate ester groups, and dibenzofuran, and carbazole. Individual SVOCs, when detected, were quantified in concentrations ranging from 36 to 11,000 μg/kg. Di-n-butyl phthalate (five detections - 68 to 260 μg/kg), butyl benzyl phthalate (one detection - 65 μg/kg) and bis (2-Ethylhexyl) phthalate (three detections - 47 to 280 μg/kg) were quantified in the surface soil samples. Phthalate ester compounds were not detected in concentrations exceeding their respective action levels. Dibenzofuran was detected in four samples in concentrations ranging from 84 to 370 μg/kg, while carbazole was quantified in five samples in concentrations ranging from 210 to 890 μg/kg. Insufficient data is available to develop a direct contact or soil protective of groundwater value for carbazole.

Total PAHs concentrations, obtained by summing the concentrations of individual PAHs, range from all individual PAHs non-detect in BCG-B2-0001 to 59,770 μg/kg in BCA-B1-0001. No samples contained individual PAHs in concentrations exceeding their respective generic industrial direct contact values. Samples BCA-B1-0001 and BCG-B1-0001 (a field duplicate pair), ASS01, ASS02, and ASS03 all contained phenanthrene in concentrations exceeding the soil protective of groundwater value of 520 μg/kg. The distribution of total PAHs and phenanthrene is presented in Figure 6-2.

Metals

Metals lists were slightly different for samples collected from locations ASB1 and ASB2 (July 1994) when compared to samples collected from locations ASS01, ASS02, or ASS03. Barium was added to the metals list for ASS01 through ASS03 and hexavalent chromium +6 was dropped from the list. Hexavalent chromium was omitted because the July 1994 data (Table 6-3) did not show that the hexavalent chromium +6 was quantified in AOC A soils in concentrations well below the soil protective of groundwater values.

The metals antimony, arsenic, barium, beryllium, cadmium, chromium (total and +6), copper, lead, nickel, and zinc were detected in the surface soils at AOC A. Of these ten metals,


AREA OF CONCERN A
PAH=37451 ug/kg
Phenanthrene 2800 ug/kg
Arsenic 13.8 mg/kg
Barium 76.7 mg/kg
Beryllium 0.50 mg/kg
Lead 62 mg/kg
Zinc 53.8 mg/kg
PAH=50043 ug/kg
Phenanthrene 5700 ug/kg
Beryllium 0.37 mg/kg
Lead 46.9 mg/kg
PAH=59770 ug/kg
Phenanthrene 5500 ug/kg
Arsenic 39.60 mg/kg
Beryllium 0.28 kg/mg
Chromium 23 mg/kg
Lead 124 mg/kg
Zinc 75 mg/kg
PAH=24344 ug/kg
Phenanthrene 1600 ug/kg
Arsenic 9 mg/kg
Beryllium 0.26mg/kg
Lead 51.6 mg/kg
Zinc 58.2 mg/kg
PAH=449 ug/kg
Arsenic 8.70 mg/kg
Antimony 3.5 mg/kg
Civil Engineering BLDG
ASS01
ASS02
ASS03
SG1
SG2
SG3
SG4
SG5
SG6
SG7
SG8
ASB1
ASB2
DISPENSERS
MO GAS STA.
APPROXIMATE LOCATION OF UST PIT
BURIED HEADWALL
LEGEND
SG1 Soil Gas Sample Location
ASB1 Soil Boring Location
ASS01 Surface Soil Sample
Fence
UST Pit
Building
AOC "A" Boundary
N
Scale 1"=30'
0
30 FEET
PAH = Sum of Polynuclear Aromatic Hydrocarbons detected in the sample
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BATTLE CREEK MICHIGAN
AREA OF CONCERN A:
WASTE ACCUMULATION AREA
SURFACE SOIL ANALYTICAL SUMMARY
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FIGURE 6-2

antimony, arsenic, barium, beryllium, chromium (total), lead, and zinc were detected in one or more samples in concentrations exceeding their respective soil protective of groundwater values. Arsenic was quantified in all five surface soils in concentrations of 6.5 to 39.6 mg/kg. Four of these detections exceed the soil protective of groundwater value for arsenic of 7.14 mg/kg. Barium (soil protective of groundwater value = 75 mg/kg) was detected in sample BCA-SS02 at 76.7 mg/kg. Chromium (total) was found in all five samples, but in only BCA-B1-0001(23 mg/kg) was the concentration of chromium quantified above the soil protective of groundwater value of 18 mg/kg. Lead was detected in concentrations exceeding the soil protective of groundwater value of 21 mg/kg in four of five samples (46.9 to 124 mg/kg), while zinc was detected in three of five samples (ranging from 53.8 to 131 mg/kg) in concentrations exceeding the soil protective of groundwater value of 48 mg/kg. Antimony and beryllium were each detected in one and four samples above the soil protective of groundwater value, respectively. The distribution of the metals detections within the surface soils which exceed the soil protective of groundwater values is also presented in Figure 6-2.

<u>6.2.3.2 Subsurface Soil</u>

The analytical results for the three AOC A subsurface soil samples collected during this SI are presented in Table 6-4, and are discussed by compound or analyte list (VOCs, SVOCs, and metals) in the following subsections.

<u>VOCs</u>

The VOCs acetone and methylene chloride (common laboratory contaminants) were detected in one or more of the subsurface soil samples collected and analyzed from AOC A. Methylene chloride was detected at a concentration of 180 μg/kg (greater than the 20x residential health-based drinking water criteria of 100 μg/kg) in one sample, BCA-B1-0507. This result was qualified B by the laboratory which indicates some type of blank contamination. Acetone was detected in a concentration of 190 μg/kg (below regulatory levels) in boring ASB1 (25 to 27 ft).

TABLE 6-4 AREA OF CONCERN A: WASTE ACCUMULATION AREA SUBSURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		ASB1		ASB1		ASB2	
SAMPLE ID:		BCA-B1-0507		BCA-B1-2527		BCA-B2-2527	
COLLECTION DATE:		06/30/84		6/30/94		07/14/94	
ASSOCIATED FIELD QC:		BCER4		BCER4		BCER4	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP VOA (µg/kg)							
Acetone	7.4E+7/15,000	11	U	190	B	10	U
Methylene chloride	3.3E+6/100	180	B	80	B	8	JB
CLP SVOA (µg/kg)							
Benzo(a)anthracene	2.1E+5/--	350	U	110	J	330	U
Benzo(a)pyrene	21,000/--	350	U	110	J	330	U
Benzo(b)fluoranthene	2.1E+5/--	350	U	230	XJ	330	U
Benzo(g,h,i)perylene	1.6E+7/--	350	U	110	J	330	U
Benzo(k)fluoranthene	2.1E+6/--	350	U	250	XJ	330	U
Chrysene	2.1E+7/--	350	U	110	J	330	U
Di-n-butyl phthalate	5.4E+8/18,000	350	U	340	U	79	J
Fluoranthene	5.4E+8/18,000	350	U	260	J	330	U
Indeno(1,2,3-cd)pyrene	2.1E+5/--	350	U	96	J	330	U
Phenanthrene	1.6E+7/520	350	U	130	J	330	U
Pyrene	3.4E+8/11,000	350	U	190	J	330	U
bis(2-Ethylhexyl)phthalate	1.1E+7/--	99	JB	690	B	330	U
CLP METAL (mg/kg)							
Antimony	1,600/0.36	4.30	N	3.20	UN	3.10	U*
Arsenic	83/6.57	75.40	*	5.40	N	5.20	AN
Beryllium	35/0.08	0.13	B	0.12	U	0.11	U
Chromium	1.0E+6/18	6.10	N	8.40	N	3.30	*
Copper	1.7E+5/32	6.20		4.10		2.80	
Lead	4.0E+2/21	33	*	3.60	*	1.90	N
Nickel	3.4E+5/20	7.60		299		4.10	U*
Zinc	1.0E+6/48	14.80	EN	19.30	EN	11.70	E

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
mg/kg milligrams/kilogram
µg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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SVOCs

Twelve individual SVOCs were detected in the subsurface soil samples, including compounds from the PAHs family and di-n-butyl and bis(2-Ethylhexyl) phthalate. Neither of the phthalate esters were detected in concentrations exceeding their respective generic industrial direct contact or soils protective of groundwater values. PAHs were only detected in the 25 to 27 ft sample interval analyzed from boring ASB1. Individual PAHs quantified in BCA-B1-2527 ranged from 96 to 250 μg/kg, while the total PAHs concentration, obtained by summing the concentrations of individual PAHs, is 1596 μg/kg. No individual PAHs was detected in a concentration greater than their generic industrial direct contact or soils protective of groundwater values.

Metals

The metals antimony, arsenic, beryllium, chromium (total only), copper, lead, nickel, and zinc were detected in the subsurface soils at AOC A. Of these eight metals, antimony, arsenic, lead, and nickel were detected in one or more samples at concentrations exceeding their respective soils protective of groundwater values. No metals were detected in concentrations exceeding the generic industrial direct contact values. Antimony was detected in the 5 to 7 ft interval from ASB1 in a concentration of 4.3 mg/kg (soil protective of groundwater value = 0.36 mg/kg). Arsenic (soil protective of groundwater value = 6.57 mg/kg) and lead (soil protective of groundwater value = 21 mg/kg) were quantified in sample BCA-B1-0507 at concentrations of 75.4 and 33 mg/kg, respectively. Nickel was detected in BCA-B1-2527 at a concentration of 299 mg/kg. The soil protective of groundwater value for nickel is 20 mg/kg. The distribution of the metal detections which exceed the soil protective of groundwater values for the subsurface soils is presented in Figure 6-3.

6.3 AREA OF CONCERN B - MOTOR POOL DRAINAGE DITCH

The field activities consisted of a soil gas survey (17 samples; 15 locations numbered SG1 through SG15) followed by collection and analysis of surface and subsurface soil samples

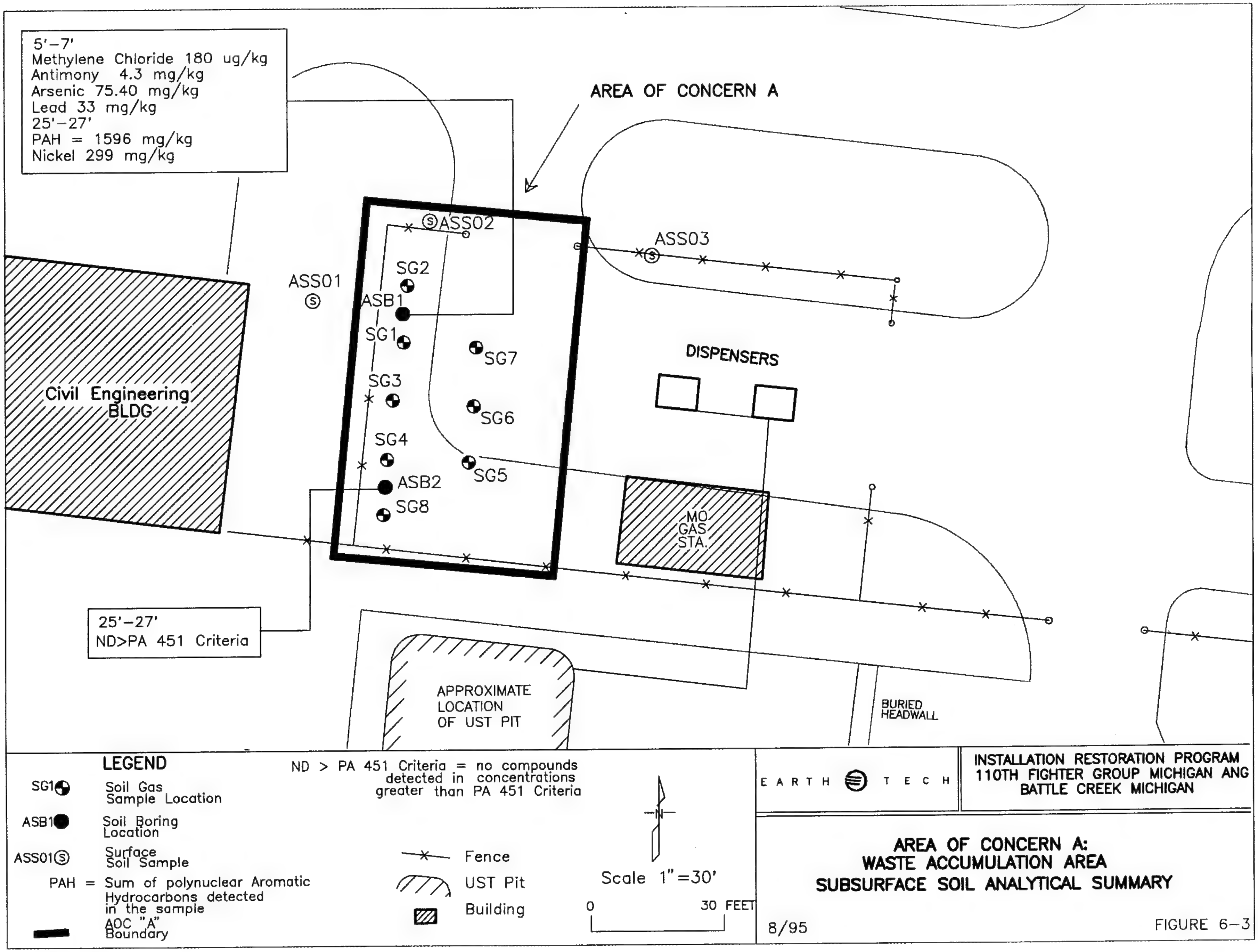

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FIGURE 6–3

fig_6–3.dwg 8/95

from borings BSB1 through BSB4. Total depths and the screening and confirmation sampling intervals for the AOC B borings are presented in the following table.

Boring Number	Total Depth (feet bgs)	Field Screen Sample Intervals	Confirmation Sample Intervals
SB1	27	0-2, 5-7, 10-12, 15-17,-20-22 and 25-27	0-2 and 25-27
BSB2	27	0-2, 5-7, 10-12, 15-17,-20-22 and 25-27	0-2 and 20-22
BSB3	11	0-2, 5-7, and 10-12	0-2 and 10-11
BSB4	12	0-2, 5-7, and 10-12	0-2, 5-7, and 10-12

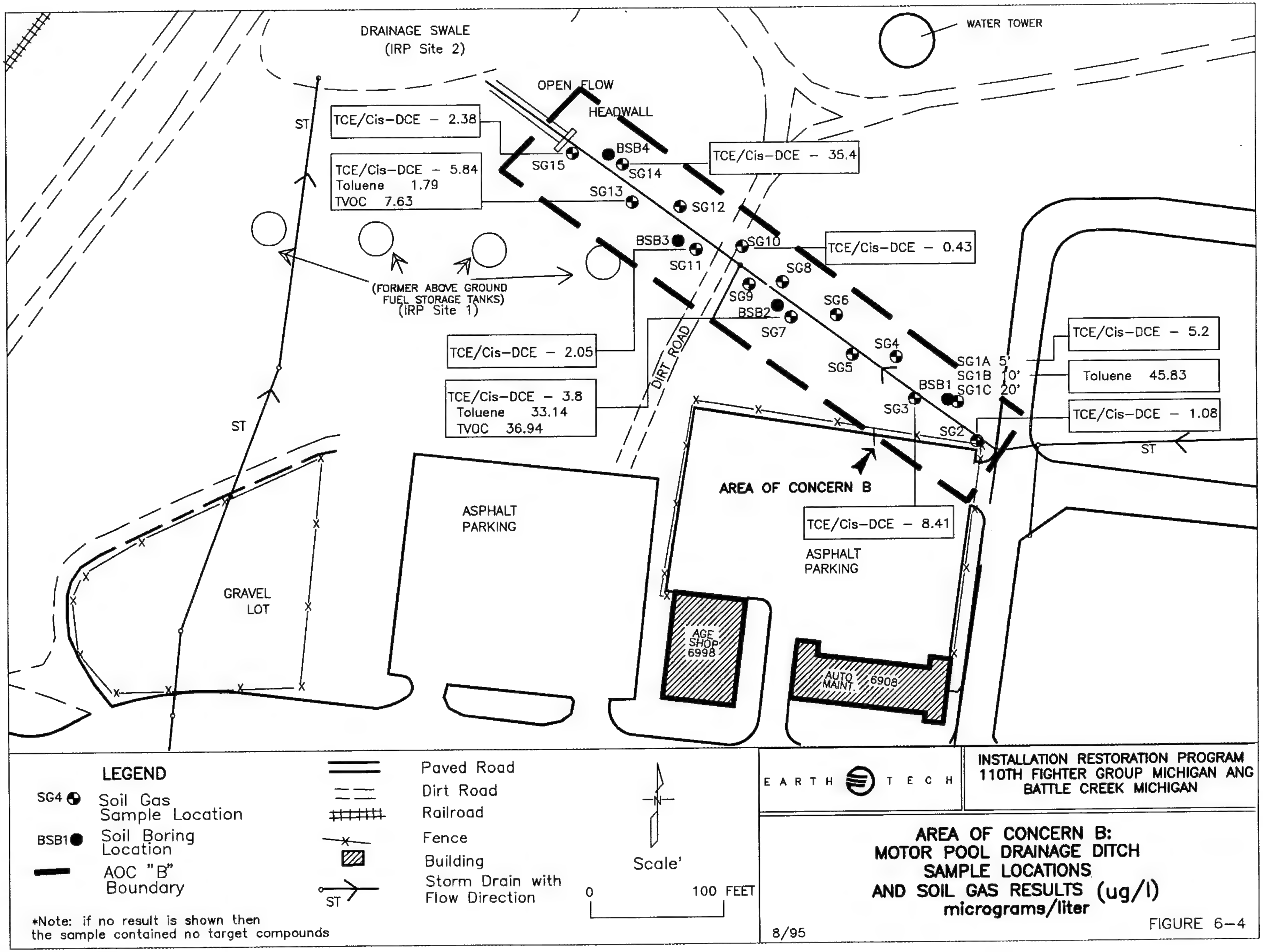
All AOC B sampling locations are presented in Figure 6-4. The results of these activities are presented in the following subsections.

6.3.1 Geology and Hydrogeology

The soils beneath AOC B were described in the field as being composed of yellowish-brown, well-sorted, fine-grained sand. These sands generally contained minor amounts of gravel. The soils (based on this SI) show little variation across the AOC. Refusal of the Geoprobe® rods at 11 and 12 ft during the sampling of borings BSB3 and BSB4, respectively, has been interpreted to indicate that gravel-rich zones exist beneath the northwestern portion of the AOC B. Because the ground surface slopes from the southeast (BSB1) towards the northwest (borings BSB2, BSB3 and BSB4) the depth to groundwater varies across the AOC B. Wet sands, indicating saturated conditions, were encountered in the 25 to 27 ft sample interval obtained from boring BSB2, while the same subsurface interval from boring BSB1 (located at a higher elevation than BSB2), was described as containing very moist sand. Groundwater flow is to the northwest across AOC B (Figure 3-7).

6.3.2 Screening Activities

The results of the soil gas and soil screening activities for AOC B are included in the following subsections.



**AREA OF CONCERN B:
MOTOR POOL DRAINAGE DITCH
SAMPLE LOCATIONS
AND SOIL GAS RESULTS (ug/l)
micrograms/liter**

FIGURE 6-4

FIG_6-4.dwg 8/95

6.3.2.1 Soil Gas Survey

The initial screening activities at AOC B consisted of collection and on-site analysis of 17 soil gas samples. The survey results are presented on Figure 6-4. Location BSG1 was vertically profiled. Samples BSG1a, b, and c were collected at depths of 5, 10, and 20 ft, respectively. TCE/cis-1,2 - DCE was detected in BSG1a at a concentration of 5.2 μg/l of air, while toluene was detected in BSG1b at a concentration of 45.83 μg/l of air. No target compounds were reported in the BSG1c. The remainder of the soil gas survey at AOC B was completed at the 5 ft depth interval. Target compounds or total VOCs were also detected in soil gas samples BSG2, -3, -7, -10, -11(duplicate), -13, -14, and -15 (Appendix A). The results of this SOV survey were used to select boring locations. Individual boring numbers and the rationale used to select each boring location is included in the following:

- BSB1 - located by SOV sample location BSG1
- BSB2 - located by SOV sample location BSG7
- BSB3 - located between SOV sample locations BSG11 and -13
- BSB4 - located between SOV sample locations BSG14 and -15

6.3.2.2 Soil Screening

Soil samples were collected from borings BSB1 through BSB4 at the surface and at 5 ft intervals until the water table was encountered. A total of 18 soil samples were obtained from these borings and analyzed for their VOC content using the on-site GC. No target compounds or total VOCs were reported from the on-site analysis of these soils. The absence of target or total VOC detections, as quantified on the field GC, is consistent with the absence of field PID detections and the lack of noticeable hydrocarbon odors detected during the collection of the AOC B soils.

6.3.3 AOC B - Soil Analytical Results

A discussion of the analytical results obtained for the surface and subsurface soils is included in the following sections.

6.3.3.1 Surface Soil

The surface soil analytical results for AOC B are presented in Table 6-5, and are discussed by compound or analyte list (VOCs, SVOCs, and metals) in the following subsections.

VOCs

Only the common laboratory contaminants acetone (23 to 69 μg/kg) and/or methylene chloride (9 to 59 μg/kg) were detected in the four surface soil samples collected and analyzed from AOC B. Neither compound was detected in a concentration greater than the generic industrial direct contact value or soil protective of groundwater values.

SVOCs

Twenty-two individual SVOCs were detected in the surface soil samples, including compounds from the PAHs and phthalate ester groups, and carbazole. Individual SVOCs, when detected, were quantified in concentrations ranging from 30 to 1,800 μg/kg. Di-n-butyl phthalate (one detection - 45 μg/kg) and bis (two-Ethylhexyl) phthalate (2 detections - 160 and 230 μg/kg) were quantified in the surface soil samples. Carbazole (65 μg/kg) was found in sample BCB-B1-0001. Phthalate ester compounds were not detected in concentrations exceeding their regulatory levels. Cleanup criteria have not been developed for carbazole. Total PAH concentrations in the surface soil samples were obtained by summing the concentrations of individual PAHs and range from 745 μg/kg in BCB-B4-0001 to 9,266 μg/kg in BCB-B1-0001. Phenanthrene (one detection - 650 mg/kg) was quantified in sample BCB-B1-0001 in a concentration exceeding the soil protective groundwater value of 520 μg/kg. The distribution of total PAHs and phenanthrene is presented in Figure 6-5.

TABLE 6-5 AREA OF CONCERN B: MOTOR POOL DRAINAGE DITCH SURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		BSB1		BSB2		BSB3		BSB4	
SAMPLE ID:		BCB-B1-0002		BCB-B2-0002		BCB-B3-0002		BCB-B4-0002	
COLLECTION DATE:		07/13/94		07/13/94		07/13/94		07/13/94	
ASSOCIATED FIELD QC:		BCER4		BCER4		BCER4		BCER6	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP VOA (μg/kg)									
Acetone	7.4E+7/15,000	29	B	69	B	25	B	23	B
Methylene chloride	3.3E+6/100	10	JB	59	B	51	B	9	JB
CLP SVOA (μg/kg)									
Anthracene	1.0E+9/1.5E+5	82	J	70	J	49	J	340	U
Benzo(a)anthracene	2.1E+5/--	680		310	J	490		55	J
Benzo(a)pyrene	21,000/--	760		210	J	520		56	J
Benzo(b)fluoranthene	2.1E+5/--	1300	X	440	X	1000	X	100	XJ
Benzo(g,h,i)perylene	1.6E+7/--	300	J	120	J	100	J	340	U
Benzo(k)fluoranthene	2.1E+6/--	1800	X	600	X	1400	X	140	XJ
Carbazole	--/--	65	J	350	U	340	U	340	U
Chrysene	2.1E+7/--	850		260	J	590		74	J
Di-n-butyl phthalate	5.4E+8/18,000	45	J	350	U	340	U	340	U
Dibenzo(a,h)anthracene	21,000/--	130	J	30	J	85	J	340	U
Fluoranthene	5.4E+8/18,000	1200		410		850		140	J
Fluorene	5.4E+8/18,000	44	J	350	U	340	U	340	U
Indeno(1,2,3-cd)pyrene	2.1E+5/--	540		160	J	220	J	340	U
Phenanthrene	1.6E+7/520	650		210	J	330	J	80	J
Pyrene	3.4E+8/11,000	930		330	J	650		100	J
bis(2-Ethylhexyl)phthalate	1.1E+7/--	230	J	160	J	340	U	340	U
CLP METAL (mg/kg)									
Antimony	1,600/0.36	3.30	UN	3.20	UN	3.10	UN	3.20	N
Arsenic	83/7.14	7.60	AN	3	AN	8.70	N	11.40	N
Beryllium	35/0.19	0.21	B	0.16	B	0.22	B	0.11	U
Cadmium	2.3E+3/1.2	0.37	UN	2.70	N	0.35	U	0.35	UN
Chromium	1.0E+6/19.1	9.90	N	58.10	N	6.80	N	7.30	N
Chromium, Cr+6 (mg/l)	2.2E+4/--	0	U	0.02		0	U	0	U
Copper	1.7E+5/32	12.40		24.60		6.10		7.30	
Lead	4.0E+2/21	36.30		200		13.70	*	16.20	*
Nickel	3.4E+5/20	8.90		4.30	U	9		10.30	
Zinc	1.0E+6/48	41.20	EN	112	EN	25	EN	36.50	EN

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000

mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
μg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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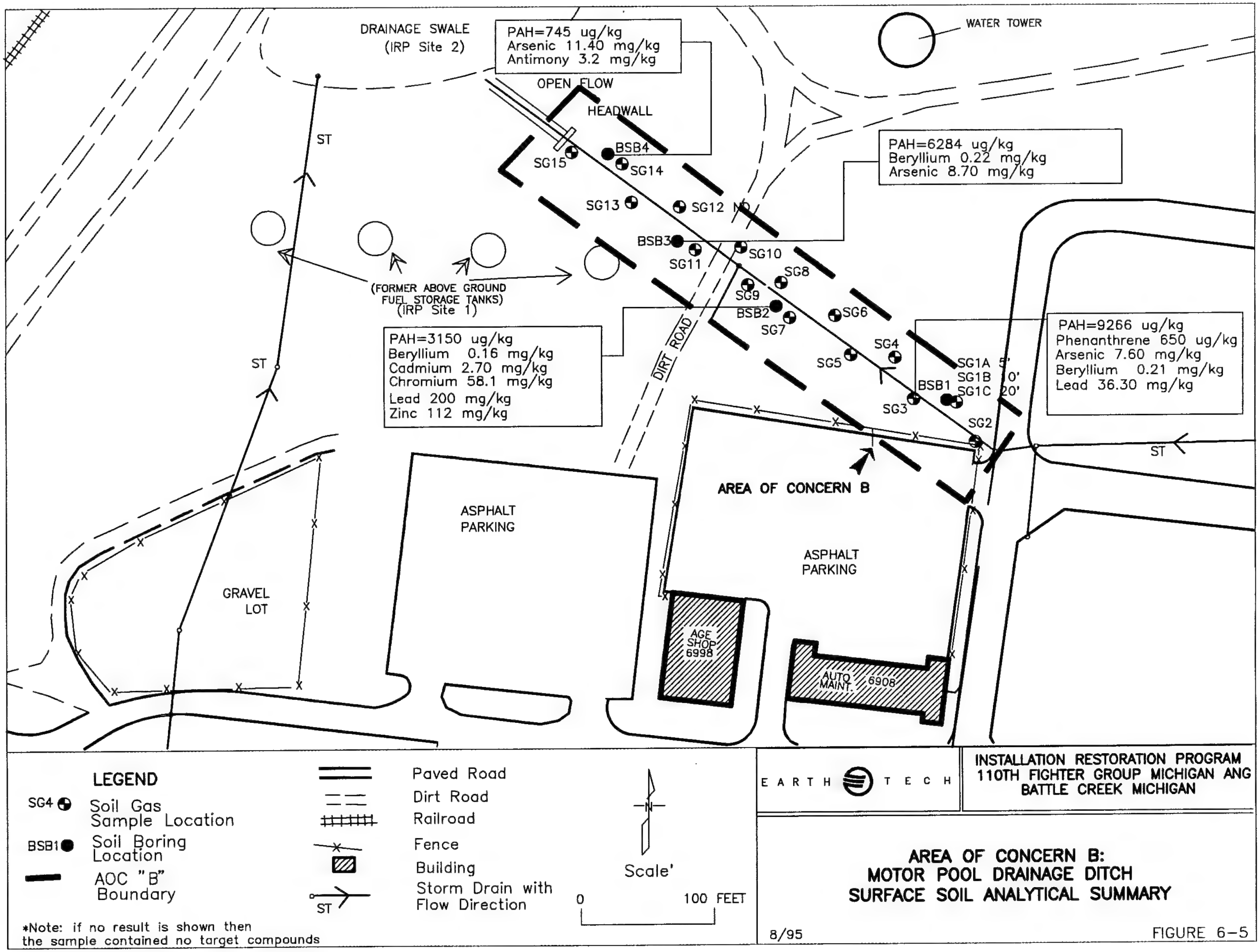

fig_6-5.dwg 8/95

Metals

The metals antimony, arsenic, beryllium, cadmium, chromium (total and +6), copper, lead, nickel, and zinc were detected in the surface soils at AOC B. Of these nine metals, antimony, arsenic, beryllium, cadmium, chromium (total), lead, and zinc were detected in one or more samples in concentrations exceeding their respective soil protective of groundwater values. Arsenic and lead concentrations exceed the soil protective of groundwater values in three of four and two of four samples collected at AOC B, respectively. Arsenic (soil protective of groundwater value = 7.14 mg/kg) concentrations range from 3 to 11.4 mg/kg, while lead (soil protective of groundwater value = 21 mg/kg) concentrations range from 13.7 to 200 mg/kg. Cadmium, chromium (total), and zinc were detected in concentrations exceeding the soil protective of groundwater value only in sample BCB-B2-0002. Antimony was detected in one sample, BCB-B4-0002, at a concentration of 3.2 mg/kg, exceeding the soil protective of groundwater values of 0.36 mg/kg. Beryllium was detected above the soil protective of groundwater value of 0.08 mg/kg within the surface soils in three samples (0.16 to 0.22 mg/kg). The distribution of the metals detections which exceed the soil protective of groundwater values is also presented in Figure 6-5.

6.3.3.2 Subsurface Soil

The subsurface soil analytical results for the five AOC B soil samples collected and analyzed during this SI are presented in Table 6-6, and are discussed by compound and analyte list (VOCs, SVOCs, and metals) in the following subsections. Sample BCG-B4-1012 is a field duplicate of sample BCB-B4-1012.

VOCs

The common laboratory contaminants acetone (21 to 44 μg/kg) and/or methylene chloride (0.6 to 10 μg/kg) were detected in all five of the subsurface soil samples collected and analyzed from AOC B. Neither compound was detected in a concentration greater than the generic

TABLE 6-6 AREA OF CONCERN B: MOTOR POOL DRAINAGE DITCH SUBSURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		BSB1		BSB2		BSB3		BSB4*		BSB4		BSB4	
SAMPLE ID:		BCB-B1-2527		BCB-B2-2022		BCB-B3-1011		BCB-B4-0507		BCB-B4-1012		BCG-B4-1012	
COLLECTION DATE:		07/13/94		07/13/94		07/13/94		07/13/94		07/13/94		07/14/94	
ASSOCIATED FIELD QC:		BCER4		BCER4		BCER6		BCER6		BCER6		BCER6	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP VOA (µg/kg)													
Acetone	7.4E+7/15,000	32	B	27	B	25	B	24	B	21	B	44	B
Methylene chloride	3.3E+6/100	9	JB	7	JB	7	JB	0	(B)	8	JB	10	JB
CLP SVOA (µg/kg)													
Di-n-butyl phthalate	5.4E+8/18,000	45	J	48	J	340	U	340	U	340	U	140	J
bis(2-Ethylhexyl)phthalate	1.1E+7/--	340	U	340		340	U	340	U	150	J	600	
CLP METAL (mg/kg)													
Antimony	1,600/0.36	3.20	UN	3.50	N	4.70	N	3.80	L	3.10	UN	3.50	U*
Arsenic	83/6.57	2	N	5.30	N	8.50	N	12.70	L	2.10	AN	1.70	N
Beryllium	35/0.08	0.12	U	0.12	B	0.22	B	0.13	()	0.11	U	0.13	U
Chromium	1.0E+6/18	3.30	N	8.50	N	8.20	N	8	L	6.20	N	4.70	*
Copper	1.7E+5/32	2.50	B	6.40		6.80		4.40		3.80		2.80	B
Lead	4.0E+2/21	2.20	A*	3.40	*	6.50	*	4.50		1.80	*	2.10	N
Mercury	1.4E+3/0.13	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.15	
Nickel	3.4E+5/20	4.20	U	15.10		10.90		6.90		21.30		13.50	*
Zinc	1.0E+6/48	12.80	EN	17.80	EN	18.40	EN	29.90	L	13.40	EN	9.10	E

BCB-B4-1012 and BCG-B4-1012 are a field duplicate pair
1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
mg/kg milligrams/kilogram
µg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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industrial direct contact value or soil protective of groundwater value for that particular compound.

SVOCs

Only two SVOCs, di-n-butyl phthalate (three detections - 45 to 140 μg/kg) and bis (2-Ethylhexyl) phthalate (three detections - 150 to 600 μg/kg) were quantified within the five subsurface soil samples collected and analyzed from AOC B. Neither compound was detected in a concentration greater than the generic industrial direct contact value or soil protective of groundwater value for that particular compound.

Metals

The metals antimony, arsenic, beryllium, chromium (total only), copper, lead, mercury, nickel, and zinc were detected in the subsurface soils at AOC B. Of these nine metals, antimony, arsenic, beryllium, mercury, and nickel were detected in one or more samples in concentrations exceeding their respective soil protective of groundwater values. No metals were detected in concentrations exceeding their generic industrial direct contact values. Antimony was detected in three samples in concentrations ranging from 3.5 to 4.7 mg/kg. These concentrations exceed the antimony soil protective of groundwater value of 0.36 mg/kg. Arsenic concentrations in two samples (8.5 and 12.7 mg/kg) exceed the soil protective of groundwater value of 6.57 mg/kg. Mercury (soil protective of groundwater value = 0.13 mg/kg) was quantified in sample BCG-B4-1012 at a concentration of 0.15 mg/kg, while nickel (soil protective of groundwater value = 20 mg/kg) was quantified in sample BCB-B4-1012 at a concentration of 21.3 mg/kg. The distribution of the metals detections which exceed their respective soil protective of groundwater values for the subsurface soils is presented in Figure 6-6.

6.4 AREA OF CONCERN C - FORMER FIRE TRAINING AREA SOUTH

The field activities completed in July 1994 consisted of a soil gas survey (22 samples; 20 locations numbered SG1 through SG20) followed by collection and analysis of surface and subsurface soil samples from borings CSB1 through CSB7, and groundwater screening

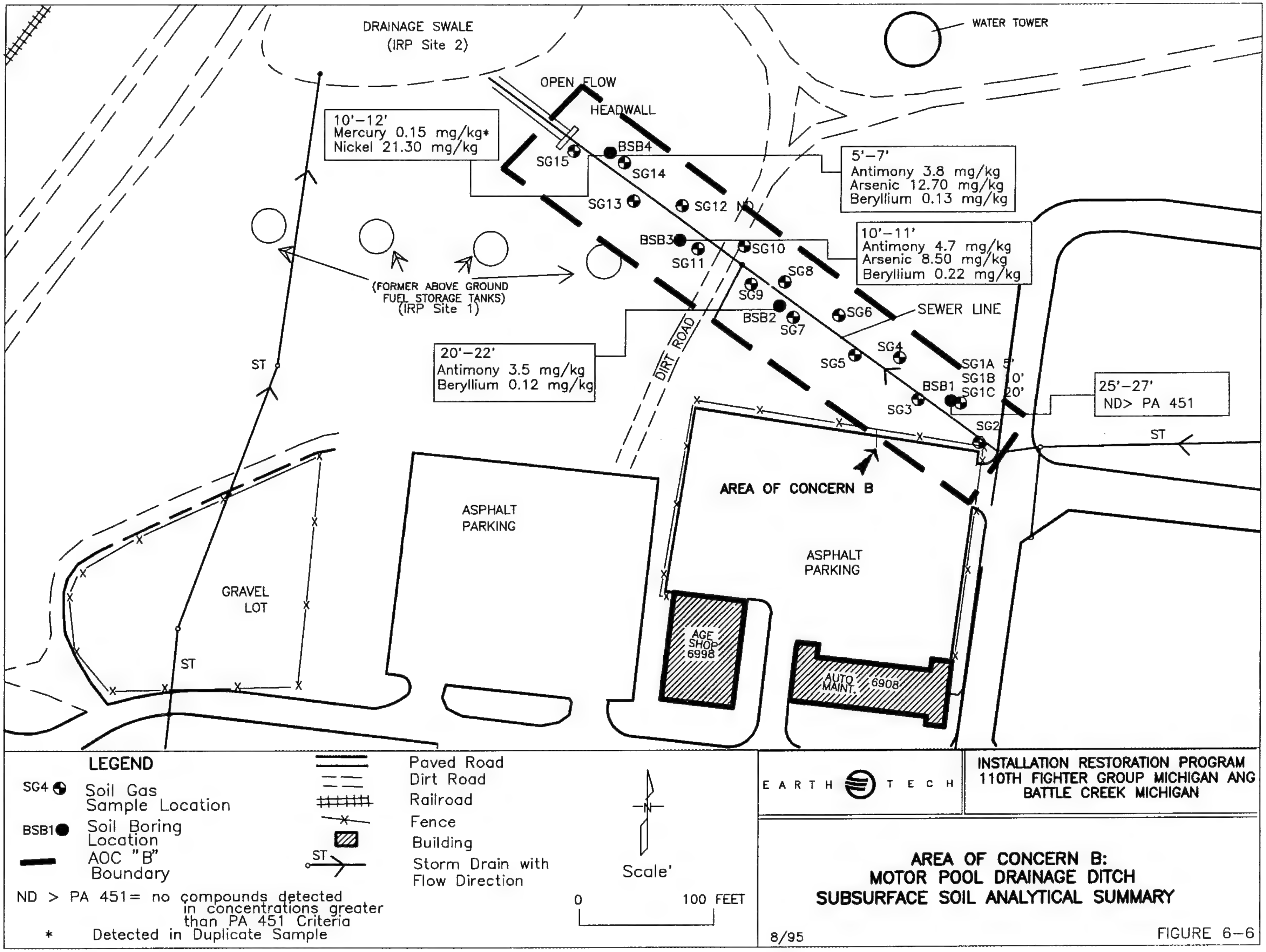


FIG_6-6.dwg 8/95

samples numbered BCC-W5 through W7. Total depths and the screening and confirmation sampling intervals for the AOC C borings are presented in the following table.

Boring Number	Total Depth (feet bgs)	Field Screen Sample Intervals	Confirmation Sample Intervals
CSB1	17	0-2, 5-7, 10-12, and 15-17	0-2 and 10-12
CSB2	12	0-2, 5-7, and 10-12	0-2, 5-7, and 10-12
CSB3	16	0-2, 5-7, 10-12, and 14-16	0-2 and 14-16
CSB4	12	0-2, 5-7, and 10-12	0-2 and 10-12
CSB5	12	---	10-12
CSB6	12	---	10-12
CSB7	12	---	10-12

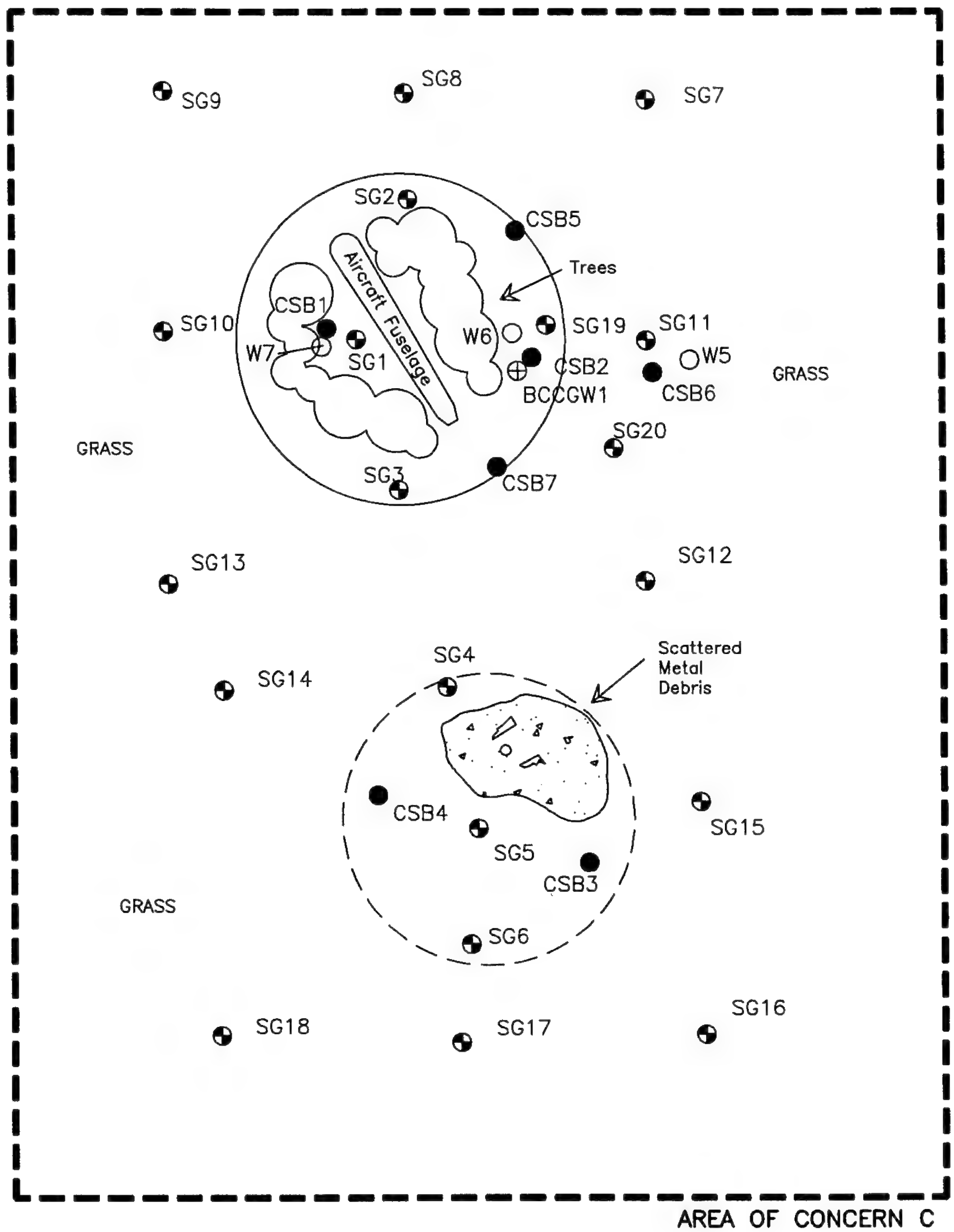
During November 1994 sample location CSB2 was resampled at the 10 to 12 ft depth interval and analyzed for polychlorinated biphenyls (PCBs) and TCLP (semi-volatile fraction only). One groundwater sample was collected from this location and analyzed for VOCs, SVOCs, and metals (filtered and unfiltered). All AOC C sampling locations are presented in Figure 6-7. The results of these activities are presented in the following subsections.

6.4.1 Geology and Hydrogeology

The soils beneath AOC C were described in the field as being composed of brown to yellowish brown, well-sorted, loose fine-grained sand. Wet sands, indicating saturated conditions, were encountered in the 15 to 17 ft sample interval obtained from CSB1. Groundwater flow is assumed to be to the northwest beneath AOC C (Figure 3-7).

6.4.2 Results of AOC C Screening Activities

The results of the SOV survey and soil and groundwater screening activities for AOC C are included in the following subsections.



LEGEND

SG18 Soil Gas Sample Location
CSB4 Soil Boring Location
W6 Groundwater Screening Location
BCCGW1 Groundwater Confirmation Location
AOC "C" Boundary
Tree Area

N

Scale 1"=30'
0 30 feet

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FIRE TRAINING AREA – SOUTH

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FIGURE 6–7

FIG_6–7.dwg 8/95

6.4.2.1 SOV and Groundwater Screening Survey

The screening results obtained from the AOC C SOV and groundwater screening activities are described below:

- Initially, location CSG1 was vertically profiled; samples CSG1a, b, and c were collected at the 5, 10 and 20 ft depth intervals. Upon retrieval of the probe rods, a hydrocarbon odor was detected on the rods that were driven into the ground to a depth greater than approximately 15 ft below ground surface (bgs). No target compounds or total VOCs were detected in these samples.

- Sample locations CSG2 through CSG18 (all collected from the 5 ft depth interval) were then sampled. Sample CSG13 contained TCE/cis-1,2-DCE at a concentration of 4.85 μg/l of air. No target compounds or total VOCs were detected in samples CSG2 through CSG12 and CSG14 through CSG18.

- Two additional samples, numbered CSG19 and CSG20 were collected from the 15 ft depth interval from within the northernmost bermed area (Figure #6-7). A hydrocarbon odor was detected on the rods retrieved from location CSG19. No target compounds or total VOCs were detected in these samples.

- Groundwater screening samples W5, W6, and W7 (Figure 6-7) were collected and analyzed for their VOC content using the field GC. Each groundwater screening sample was collected at depths between 14 and 16 ft bgs. No target compounds or total VOCs were detected in these samples.

Soil borings CSB1 and CSB2 were located inside the northernmost bermed area by SOV locations CSG1 and CSG19 (hydrocarbon odors). Borings CSB3 and CSB4 were located in the southern previously bermed area. Borings CSB5, CSB6, and CSB7 were advanced to define the limits of the suspected contamination detected during the sampling of CSB2.

6.4.3 AOC C - Soil Analytical Results

Soil samples were initially collected from borings CSB1 through CSB4 at the surface and at 5 ft intervals until the water table was encountered. Additional samples were collected from borings CSB5 through CSB7 from the 10 to 12 ft bgs interval only. A total of 20 soil samples were obtained from these borings and were analyzed for their VOC content using the on-site GC. During the analysis of sample BCC-B2-1012 the detector connected to the on-site GC became saturated with hydrocarbons. No other samples contained target compounds or total VOCs. The results of the field GC analysis is consistent with the field PID readings obtained during the collection of the AOC C samples.

6.4.3.1 Surface Soil

The surface soil analytical results for AOC C are presented in Table 6-7, and are discussed by compound type and analyte list (VOCs, SVOCs, and metals) in the following subsections.

VOCs

The common laboratory contaminants acetone (11 to 19 μg/kg) and methylene chloride (5 to 15 μg/kg) were detected in one or more of the four surface soil samples collected and analyzed from AOC C. Neither compound was detected in a concentration greater than their respective generic industrial direct contact values or soil protective of groundwater values.

SVOCs

Only two SVOCs were detected in the surface soil samples. Both compounds were members of the phthalate ester group. Di-n-butyl phthalate was detected in all four samples at concentrations of 74 to 120 μg/kg, while bis(2-Ethylhexyl) phthalate was quantified in three of the four samples at concentrations ranging from 38 to 140 μg/kg. Neither compound was detected in a concentration greater than their respective generic industrial direct contact values or soil protective of groundwater values.

TABLE 6-7 AREA OF CONCERN C: FIRE TRAINING AREA - SOUTH SURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		CSB1		CSB2		CSB3		CSB4	
SAMPLE ID:		BCC-B1-0002		BCC-B2-0002		BCC-B3-0002		BCC-B4-0002	
COLLECTION DATE:		07/14/94		07/14/94		07/14/94		07/14/94	
ASSOCIATED FIELD QC:		BCER6		BCER6		BCER6		BCER7	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP VOA (μg/kg)									
Acetone	7.4E+7/15,000	11	U	19	B	14	B	11	B
Methylene chloride	3.3E+6/100	9	JB	15	B	9	JB	5	JB
CLP SVOA (μg/kg)									
Di-n-butyl phthalate	5.4E+8/18,000	100	J	92	J	74	J	120	J
bis(2-Ethylhexyl)phthalate	1.1E+7/--	77	J	38	J	140	J	340	U
CLP METAL (mg/kg)									
Arsenic	83/7.14	1.90	N	8.70	AN	2.10	N	1.50	N
Beryllium	35/0.19	0.12	U	0.11	U	0.12	U	0.14	B
Cadmium	2.3E+3/1.2	0.36	U	0.35	U	0.36	U	0.39	
Chromium	1.0E+6/19.1	6.10	*	7.10	*	5.60	*	5.40	*
Chromium, Cr+6 (mg/l)	2.2E+4/--	0	U	0.02		0.01		0	U
Copper	1.7E+5/32	6		3.50		3.60		4.10	
Lead	4.0E+2/21	10.20	N	2.80	N	1.90	N	2.50	N
Nickel	3.4E+5/20	4.50	*	8.80	*	4.20	U*	4.10	U*
Zinc	1.0E+6/48	16	E	12	E	11.70	E	14.90	E

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000

mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
μg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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Metals

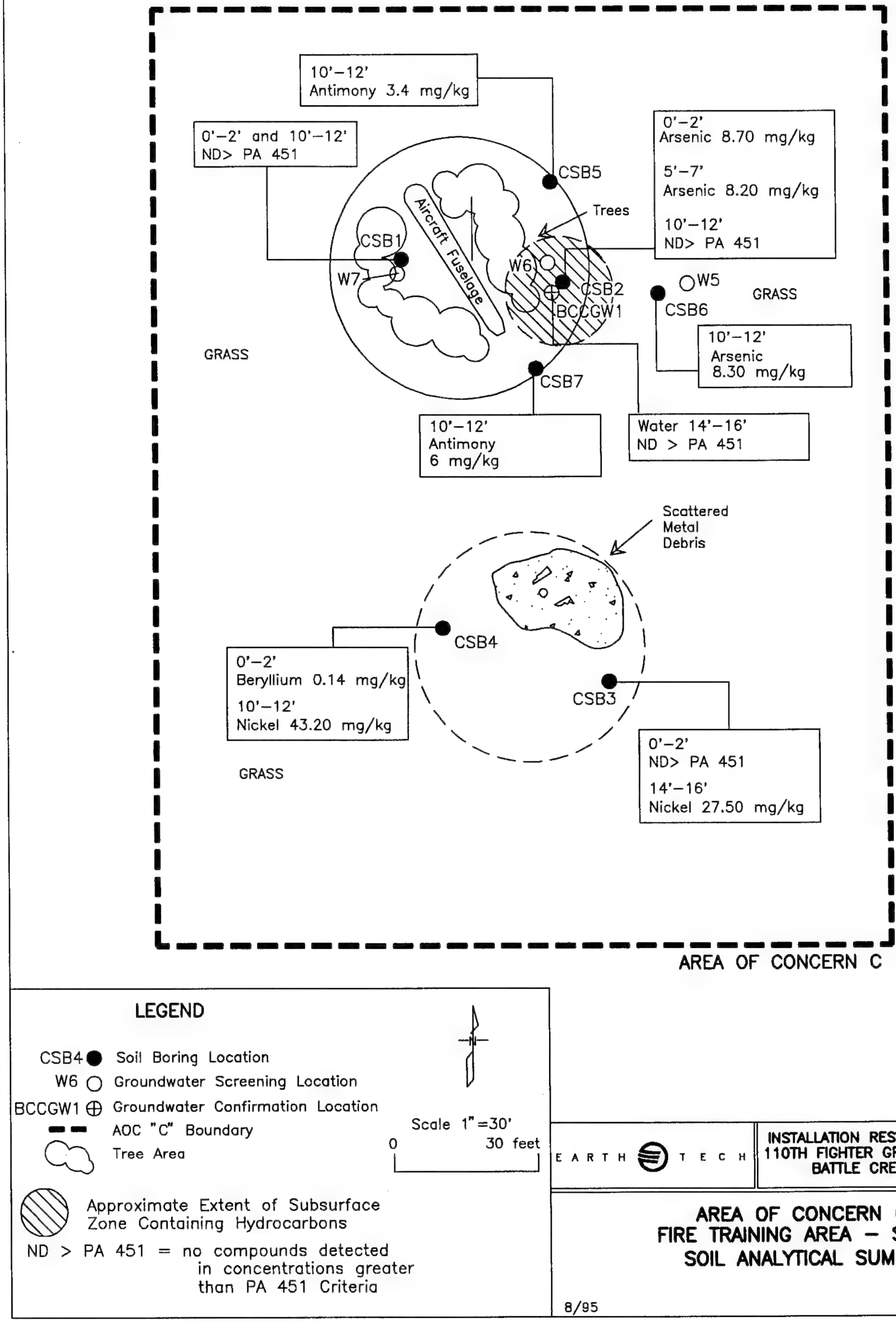
The metals arsenic, beryllium, cadmium, chromium (total and +6), copper, lead, nickel, and zinc were detected in the surface soils at AOC C. Of these eight metals, only arsenic and beryllium were detected at concentrations exceeding their soil protective of groundwater values. Arsenic was quantified in sample BCC-B2-0002 at a concentration of 8.7 mg/kg, which is above the soil protective of groundwater value of 7.14 mg/kg, while beryllium (0.14 mg/kg) was detected in BCC-B4-0002 at a concentration exceeding its soil protective of groundwater value of 0.08 mg/kg. Analytical results illustrating which compounds were detected within the surface soils above soil protective of groundwater values are shown in Figure 6-8.

6.4.3.2 Subsurface Soil

The subsurface soil analytical results for the eight AOC C soil samples collected and analyzed during this SI are presented in Table 6-8 and are discussed by compound list (VOCs, SVOCs, and metals) in the following subsections. Sample BCC-B2-1012 was analyzed for VOCs, SVOCs, and metals during the July 1994 field event. The same location was resampled and analyzed for PCBs and TCLP (semi-volatile fraction only) during November 1994. Sample BCG-B7-1012 is a field duplicate of sample BCC-B7-1012.

VOCs

The common laboratory contaminants acetone (10 to 140 μg/kg) and/or methylene chloride (8 to 87 μg/kg) were detected in all nine of the subsurface soil samples collected and analyzed from AOC C. Neither analyte was detected in a concentration greater than their respective generic industrial direct contact values or soil protective of groundwater values.



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AREA OF CONCERN C:
FIRE TRAINING AREA – SOUTH
SOIL ANALYTICAL SUMMARY

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FIGURE 6–8

FIG_6–8.DWG 8/95

TABLE 6-8 AREA OF CONCERN C: FIRE TRAINING AREA SOUTH SUBSURFACE SOIL ANALYTICAL RESULTS

LOCATOR:	CSB1		CSB2		CSB2*[a]		CSB3		CSB4		CSB5	
SAMPLE ID:	BCC-B1-1012		BCC-B2-0507		BCC-B2-1012		BCC-B3-1416		BCC-B4-1012		BCC-B5-1012	
COLLECTION DATE:	07/14/94		07/14/94		07/14/94		07/14/94		07/14/94		07/15/94	
ASSOCIATED FIELD QC:	BCER6		BCER6		BCER6		BCER7		BCER7		BCER7	
PA451 PART 201 CRITERIA [b]	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP VOA (μg/kg)												
Acetone 7.4E+7/15,000	30		30	B	31		31	B	46	B	11	U
Methylene chloride 3.3E+6/100	27	B	8	JB	13	B	17	B	11	B	12	B
CLP SVOA (μg/kg)												
Di-n-butyl phthalate 5.4E+8/18,000	82	J	79	J	6100	U	66	J	52	J	80	J
bis(2-Ethylhexyl)phthalate 1.1E+7/--	63	J	350	U	6100	U	320	J	180	J	54	J
CLP METAL (mg/kg)												
Antimony 1,600/0.36	3.60	U*	3.20	U*	3.70	UL	3.50	U*	3.40	U*	3.40	*
Arsenic 83/6.57	1.80	N	8.20	AN	1.60		2	N	1.50	N	1.60	N
Chromium 1.0E+6/18	5.30	*	3.40	*	5.10		7	*	8.30	*	5.70	*
Chromium, Cr+6 (mg/ℓ) 2.2E+4/--	0	U	0	U	0.01		0	U	0	U	0	U
Copper 1.7E+5/32	2	B	2.80		3.50		2.90	B	3.20		3.40	
Lead 4.0E+2/21	1.60	N	2.10	N	1.60	L	1.80	N	1.50	N	1.30	N
Nickel 3.4E+5/20	4.70	U*	15.20	*	4.90	U	27.50	*	43.20	*	7.50	*
Zinc 1.0E+6/48	10.80	E	12.60	E	11.70		8.80	E	10.20	E	12	E
SW-846 PCBs (μg/kg)												
Aroclor-1260 21,000/--	NA		NA		21.5	P	NA		NA		NA	

BCC-B7-1012 and BCG-B7-1012 are a field duplicate pair
1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
μg/kg micrograms/kilogram
NA Not analyzed for
* Sample validated using HAZWRAP level C QC
(a) PCBs were sampled 11/8/94
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix
P Greater than 25% difference between initial and confirmation GC runs

TABLE 6-8 AREA OF CONCERN C: FIRE TRAINING AREA SOUTH SUBSURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		CSB6		CSB7		CSB7	
SAMPLE ID:		BCC-B6-1012		BCC-B7-1012		BCG-B7-1012	
COLLECTION DATE:		07/15/94		07/15/94		07/15/94	
ASSOCIATED FIELD QC:		BCER7		BCER7		BCER7	
	PA451 PART 201 CRITERIA [b]	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP VOA ($\mu g/kg$)							
Acetone	7.4E+7/15,000	12	J	140		10	J
Methylene chloride	3.3E+6/100	87	B	47	B	13	B
CLP SVOA ($\mu g/kg$)							
Di-n-butyl phthalate	5.4E+8/18,000	72	J	160	J	40	J
bis(2-Ethylhexyl)phthalate	1.1E+7/--	420	U	87	J	84	J
CLP METAL (mg/kg)							
Antimony	1,600/0.36	3.90	U*	3.40	U*	6	N
Arsenic	83/6.57	3.20	N	8.30	AN	2.50	N*
Chromium	1.0E+6/18	5.40	*	6.20	*	2.80	*
Chromium, Cr+6 (mg/ℓ)	2.2E+4/--	0	U	0	U	0	U
Copper	1.7E+5/32	3.40		4.60		1.90	B
Lead	4.0E+2/21	2.40	N	2.50	N	0.18	UQN*
Nickel	3.4E+5/20	5.10	U*	6.20	*	4.40	U
Zinc	1.0E+6/48	13.70	E	17.40	E	9.70	E
SW-846 PCBs ($\mu g/kg$)							
Aroclor-1260	21,000/--	NA		NA		NA	

BCC-B7-1012 and BCG-B7-1012 are a field duplicate pair
1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
$\mu g/kg$ micrograms/kilogram
NA Not analyzed for
* Sample validated using HAZWRAP level C QC
(a) PCBs were sampled 11/8/94
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix
P Greater than 25% difference between initial and confirmation GC runs

t6-8_1.027-April 11, 1996

SVOCs and PCBs

Only two SVOCs were detected in the subsurface soil samples. Both compounds were members of the phthalate ester group. Di-n-butyl phthalate was detected in eight of the nine samples in concentrations ranging from 40 to 160 μg/kg, while bis(2-Ethylhexyl) phthalate was quantified in six of the nine samples in concentrations ranging from 54 to 320 μg/kg. Neither compound was detected in a concentration greater than the generic industrial direct contact value or soil protective of groundwater value for that respective compound.

Sample BCC-B2-1012 contained relatively high levels of tentatively identified compounds (TICs). Concentrations of the twenty TICs (hydrocarbons), quantified during the library search completed by the laboratory, ranged from 6,900 to 68,000 μg/kg. By necessity, the sample was diluted (approximately 20:1) to quantify the relatively high concentrations of the TICs in this sample. The high dilution factor applied to this soil sample resulted in elevated detection limits for the target SVOCs, all of which were quantified as non-detects. The potential exists that SVOCs exist within the soils. However, these compounds could not be quantified because of the large number of interfering peaks (TICs) on the chromatogram. Based on information obtained from an analysis of the chromatogram from this sample, additional analyses for TCLP (semi-volatile fraction only) and PCBs were completed on this sample. One PCB compound, Aroclor-1260, was quantified in BCC-B2-1012 at a concentration of 21.5 μg/kg. The generic industrial direct contact value for PCBs is 17,000 μg/kg. No soil protective of groundwater value exists for PCBs. No SVOCs (by TCLP) were quantified above the reporting limits in sample BCC-B2-1012. TCLP analytical results are included in Appendix E.

Metals

The metals antimony, arsenic, chromium (total and +6 valence), copper, lead, nickel, and zinc were detected in the subsurface soils at AOC C. Chromium +6 and antimony were detected in one and two samples, respectively. The remaining metals, arsenic, chromium, copper, lead, nickel, and zinc were detected more frequently (five to nine times). Of these six metals, only antimony, arsenic and nickel were detected in concentrations exceeding their

respective soil protective of groundwater values. No metals were detected above their respective generic industrial direct contact values. Arsenic concentrations exceed the soil protective of groundwater values of 6.57 mg/kg in samples BCC-B2-0507 (8.2 mg/kg) and BCC-B7-01012 (8.3 mg/kg), while nickel concentrations exceed the soil protective of groundwater value (20 mg/kg) in samples BCC-B3-1416 and BCC-B4-1012. Antimony was detected above its soil protective of groundwater value (0.36 mg/kg) in two samples, BCC-B7-1012 (6 mg/kg) and BCC-B5-1012 (3.4 mg/kg). The distribution of metals detections above the soil protective of groundwater values are included on Figure 6-8.

6.4.4 AOC C - Groundwater Analytical Results

Based upon the subsurface soil sampling results from BCC-B2-1012 it was suspected that hydrocarbons had migrated to the groundwater surface (estimated to be at approximately 14 ft) beneath the northernmost bermed areas. One confirmation groundwater sample (BCC-GW1) was collected at location CSB2 to investigate this possibility. BCC-GW1 was collected from a depth interval of 14 to 16 ft bgs using Geoprobe® sample collection methods. This sample was analyzed for VOCs, SVOCs, and metals (filtered and unfiltered) in an analytical laboratory. Analytical results are presented in Table 6-9. No groundwater monitoring wells exist at the AOC C. Extrapolating the groundwater flow direction from Site 4 towards AOC C (Figures 3-7 and 3-8) suggests that groundwater flow is to the west/northwest beneath AOC C.

VOCs

Methylene chloride (a common laboratory contaminant) and xylenes (total) were detected in this groundwater sample at concentrations of 0.9 and 0.8 μg/l, respectively. Both compounds were quantified in concentrations less than their respective generic residential health-based drinking water values.

TABLE 6-9 AREA OF CONCERN C: FIRE TRAINING AREA - SOUTH GROUNDWATER ANALYTICAL RESULTS

LOCATOR:		CGW1		CGW1	
SAMPLE ID:		BCC-GW1		BCC-GW1F[a]	
COLLECTION DATE:		11/08/94		11/08/94	
	PA451 PART 201 CRITERIA [b]	RESULT	QUAL	RESULT	QUAL
8010/8020 VOC ($\mu g/l$)					
Methylene chloride	5	0.90	JB	-	
Xylenes (Total)	10,000	0.80	J	-	
CLP SVOC ($\mu g/l$)					
2-Methylnaphthalene	ID	4	J	-	
bis(2-Ethylhexyl)phthalate	6	2	J	-	
CLP METAL ($\mu g/l$)					
Arsenic	50	3.80	B	4.80	B
Barium	2,000	19.30	B	19.20	B
Copper	1,400	66.60		7.60	U
Zinc	2,400	6.50	B	5.20	U

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
$\mu g/l$ micrograms/liter
ID Insufficient data available to develop criteria
* Sample validated using HAZWRAP level C QC
(a) Filtered sample
(b) Generic residential health-based drinking water values

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Possible blank contamination
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

t6-09_1.027-April 23, 1996

SVOCs

Only two SVOCs were detected in groundwater sample BCC-GW1; 2-methylnapthalene (4 μg/l and bis(2-Ethylhexyl) phthalate (2 μg/l). Bis (2-Ethylhexyl) phthalate was quantified in a concentration less than the generic residential health-based drinking water value of 6 μg/l. According to guidance contained in the MERA Operational Memorandum #8, Revision 4 (MDNR, June 5, 1995) inadequate data is available to develop criteria for 2-methylnapthalene.

Metals

The metals arsenic, barium, copper (unfiltered sample only), and zinc (unfiltered sample only) were detected in groundwater sample BCC-GW1. No metals were detected in concentrations exceeding their respective generic residential health-based drinking water values.

6.5 AREA OF CONCERN D - FORMER FIRE TRAINING AREA WEST

The field activities consisted of a soil gas survey (14 samples; 12 locations numbered SG1 through SG12) followed by collection and analysis of surface and subsurface soil samples from borings DSB1 and DSB2. Total depths, screening, and confirmation sampling intervals for AOC D borings are presented in the following table.

Boring Number	Total Depth (feet bgs)	Field Screen Sample Intervals	Confirmation Sample Intervals
DSB1	27	0-2, 5-7, 15-17, 20-22, and 25-27	0-2 and 25-27
DSB2	7	0-2, and 5-7	0-2 and 5-7

All AOC D sampling locations are presented in Figure 6-9. The results of these activities are presented in the following subsections.

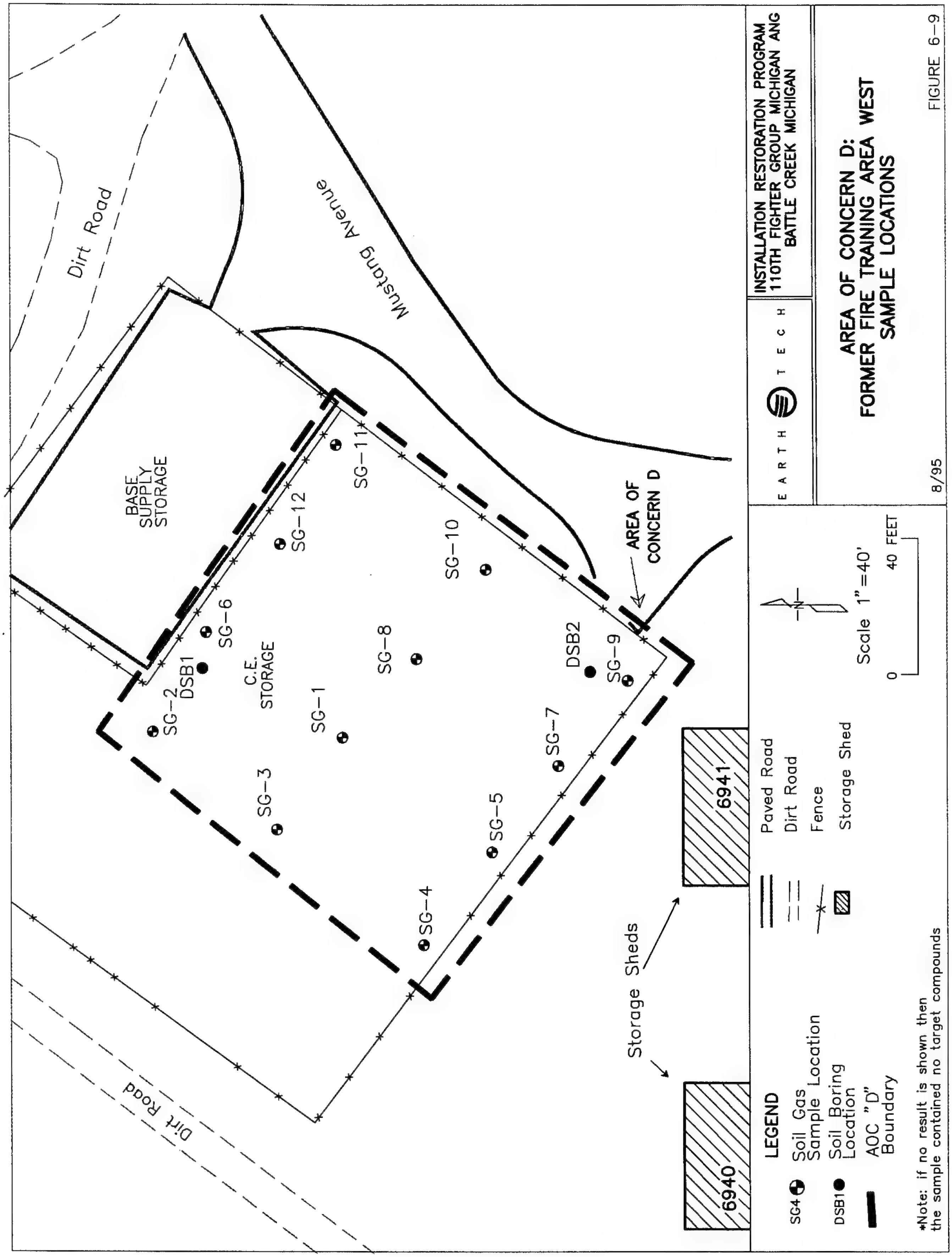


FIG_6-9.DWG 8/95

6.5.1 Geology and Hydrogeology

The soils beneath AOC D were described in the field as being composed of yellowish-brown, well-sorted, fine-grained sand. The sands themselves did not contain significant amounts of gravel. However, distinct gravel layers were encountered in the subsurface beneath AOC D. Refusal of the Geoprobe® rods occurred at 11 and 8 ft bgs during the sampling of borings DSB1 and DSB2, respectively. Three attempts were made to collect the 10 to 12 ft bgs sample from DSB1. After the third attempt, the sample interval was skipped and the boring advanced to the 15 to 17 ft bgs sample interval. Five attempts (in roughly a 20 ft radius around location DSB2) were made to advance the Geoprobe® rods below 8 ft bgs before determining that refusal was reached. In both cases, refusal was interpreted to be due to the gravel-rich zones existing in the subsurface. Damp sands, interpreted to be the beginning or the top of the saturated zone, were encountered in the 25 to 27 ft sample interval obtained from boring DSB1. Groundwater flow is toward the northwest beneath AOC D (Figure 3-7).

6.5.2 Results of AOC D Screening Activities

The results of the soil gas and soil screening activities for AOC D are included in the following subsections.

6.5.2.1 Soil Organic Vapor Survey

The initial screening activities at AOC D consisted of collection and on-site analysis of 14 soil gas samples. Location SG1 was vertically profiled. Samples SG1a, b, and c were collected at depths of 5, 10, and 20 ft, respectively. TCE/cis - 1,2 - DCE was detected at all three depths sampled at location DSG1. Sample DSG6 contained TCE/cis-1,2-DCE, PCE, and total VOCs at concentrations of 17.79, 31.56, and 49.35 μg/l of air. No other SOV samples collected and analyzed from AOC D contained target compounds or total VOCs. Based on data collected during the SOV survey two borings were advanced at AOC D. Boring DSB1 was located by SG6 and SG1 (the two SOV samples which contained target compounds). Boring DSB2 was located south of boring DSB1 and was placed in this location to provide representative geographic coverage across the AOC D.

6.5.2.2 Soil Screening

Soil samples were collected from borings DSB1 at the surface and at 5 ft intervals until the water table was encountered. DSB2 was sampled at the surface and to a depth of 8 ft bgs. The seven soil samples obtained from these borings were analyzed for their VOC content using the on-site GC. No target compounds or total VOCs were reported from the on-site analysis of these soils. The absence of target or total VOC detections, as quantified on the field GC, is consistent with the absence of field PID detections and the lack of noticeable hydrocarbon odors detected during the collection of the AOC D samples.

6.5.3 AOC D - Soil Analytical Results

A discussion of the analytical results obtained for the AOC D surface and subsurface soils is included in the following sections.

6.5.3.1 Surface Soil

The surface soil analytical results for AOC D are presented in Table 6-10, and are discussed by compound list (VOCs, SVOCs, and metals) in the following subsections.

The ground surface at AOC D was, in most places, covered with coal particles. However, the ground surface at locations DSB1 and DSB2 did not contain significant amounts of coal.

VOCs

Only the common laboratory contaminants, acetone (one detection - 19 μg/kg) and/or methylene chloride (two detections - each 9 μg/kg) were detected in the surface soil samples collected and analyzed from AOC D. Neither compound was detected in a concentration greater than its corresponding generic industrial direct contact values or soil protective of groundwater value.

TABLE 6-10 AREA OF CONCERN D: FORMER FIRE TRAINING AREA - WEST SURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		DSB1		DSB2*	
SAMPLE ID:		BCD-B1-0002		BCD-B2-0002	
COLLECTION DATE:		07/15/94		07/15/94	
ASSOCIATED FIELD QC:		BCER6		BCER6	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL
CLP VOA ($\mu g/kg$)					
Acetone	7.4E+7/15,000	10	U	19	
Methylene chloride	3.3E+6/100	9	JB	9	(B)
CLP SVOA ($\mu g/kg$)					
Di-n-butyl phthalate	5.4E+8/18,000	57	J	54	()
bis(2-Ethylhexyl)phthalate	1.1E+7/--	36	J	340	U
CLP METAL (mg/kg)					
Arsenic	83/7.14	24.40	N*	5	L
Beryllium	35/0.19	0.21	B	0.17	()
Chromium	1.0E+6/19.10	8.50	*	17.60	
Chromium, Cr+6 (mg/l)	2.2E+4/--	0.02		0.01	
Copper	1.7E+5/32	4.70		8.30	
Lead	4.0E+2/21	3.90	N*	3.20	B
Mercury	1.4E+3/0.13	0.15	*	0.17	
Nickel	3.4E+5/20	17.40		8.70	
Zinc	1.0E+6/48	16	E	65.20	

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000

mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
$\mu g/kg$ micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

SVOCs

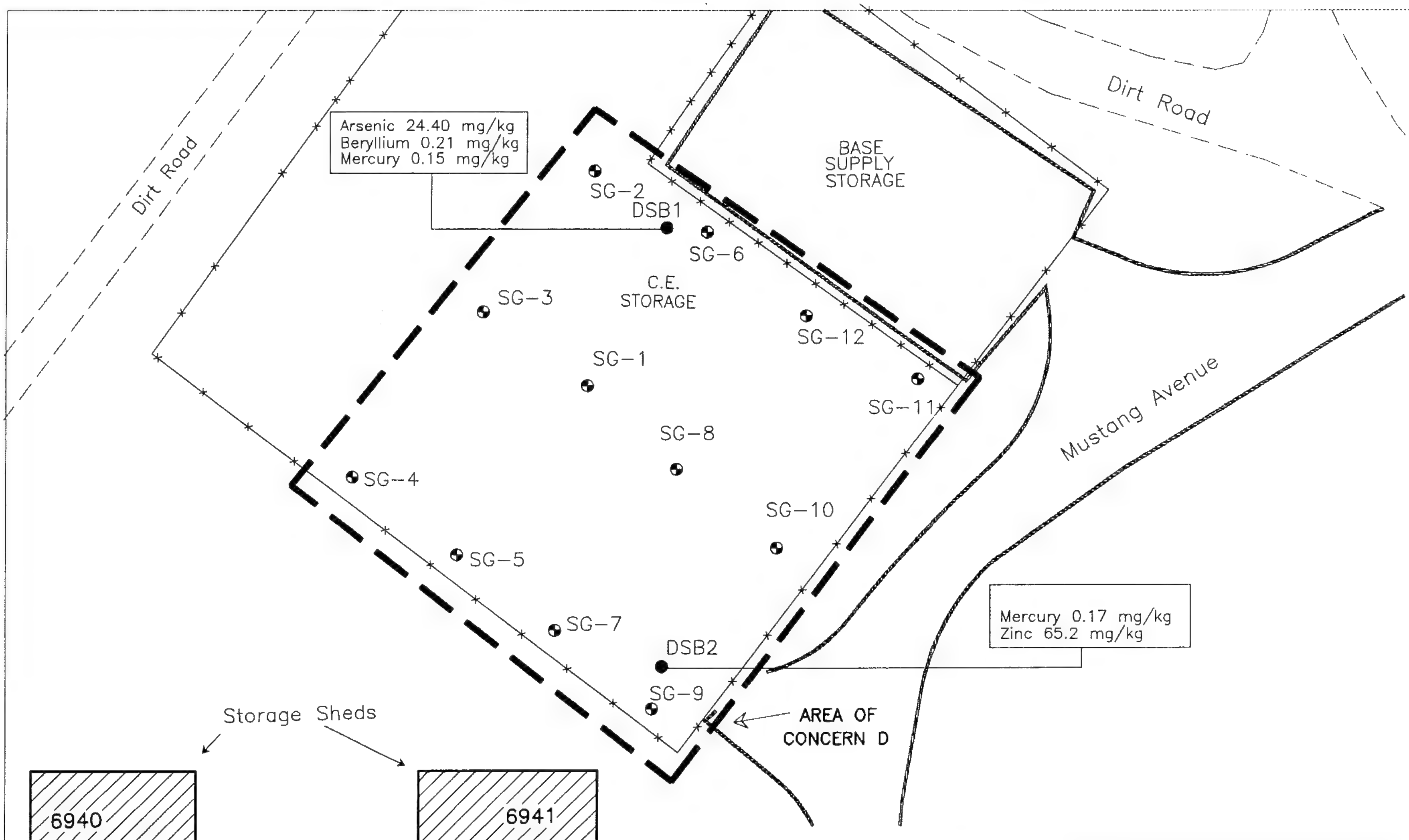
Only two SVOCs were detected in the surface soil samples. Both compounds were members of the phthalate ester group of compounds. Di-n-butyl phthalate and bis(2-Ethylhexyl) phthalate were quantified in the two soil samples at relatively low concentrations; 36 to 57 μg/kg. Neither compound was detected in a concentration greater than their respective generic industrial direct contact values, or soil protective of groundwater value.

Metals

The metals arsenic, beryllium, chromium (total and +6 valence), copper, lead, mercury, nickel, and zinc were all detected in both surface soil samples collected and analyzed from AOC D. No metals were detected in concentrations above their respective generic industrial direct contact values. Arsenic, beryllium, mercury, and zinc were detected in concentrations exceeding their respective soil protective of groundwater values. Arsenic (soil protective of groundwater value = 7.14 mg/kg) and mercury (soil protective of groundwater value = 0.13 mg/kg) were quantified in BCD-B1-0001 in concentrations of 24.4 and 0.15 mg/kg, respectively, while mercury and zinc (soil protective of groundwater value = 47 mg/kg) were quantified in BCD-B1-0001 in concentrations of 0.17 and 65.2 mg/kg, respectively. Berylllium was quantified in BCD-B1-0001 in a concentration of 0./21 mg/kg, which exceeds the soil protective of groundwater value of 0.19 mg/kg. The distribution of the metals detections which exceed the soil protective of groundwater values for the surface soils is presented in Figure 6-10.

6.5.3.2 Subsurface Soil

The soil analytical results for the two AOC D subsurface samples collected and analyzed during this SI are presented in Table 6-11, and are discussed by analyte type (VOCs, SVOCs, and metals) in the following subsections.



LEGEND

SG4 Soil Gas Sample Location

DSB1 Soil Boring Location

AOC "D" Boundary

Paved Road

Dirt Road

Fence

Storage Shed

Scale 1"=40'

0 40 FEET

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**AREA OF CONCERN D:
FORMER FIRE TRAINING AREA WEST
SURFACE SOIL ANALYTICAL SUMMARY**

10-94

FIGURE 6-10

FIG_6-10.DWG 8/95

TABLE 6-11 AREA OF CONCERN D: FORMER FIRE TRAINING AREA - WEST SUBSURFACE SOIL ANALYTICAL RESULTS

	LOCATOR:	DSB1		DSB2	
	SAMPLE ID:	BCD-B1-2527		BCD-B2-0507	
	COLLECTION DATE:	07/15/94		07/15/94	
	ASSOCIATED FIELD QC:	BCER7		BCER7	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL
CLP VOA (µg/kg)					
Methylene chloride	3.3E+6/100	7	JB	12	B
CLP SVOA (µg/kg)					
bis(2-Ethylhexyl)phthalate	1.1E+7/--	540		350	U
Carbozole	--/--	360	U	55	J
CLP METAL (mg/kg)					
Arsenic	83/6.57	4.10	N*	6	AN*
Beryllium	35/0.08	0.12	U	0.13	B
Chromium	1.0E+6/18	5.70	*	5.80	*
Copper	1.7E+5/32	4		4.60	
Lead	4.0E+2/21	3.10	N*	4.10	AN*
Nickel	3.4E+5/20	6.20		7.60	
Zinc	1.0E+6/48	19.10	E	14.80	E

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
mg/kg milligrams/kilogram
µg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

t6-11_1.027-April 23, 1996

VOCs

Only methylene chloride (7 and 12 μg/kg), a common laboratory contaminant, was detected in the subsurface soil samples collected and analyzed from AOC D. Methylene chloride was not detected in a concentration greater than the generic industrial direct contact values or soil protective of groundwater value.

SVOCs

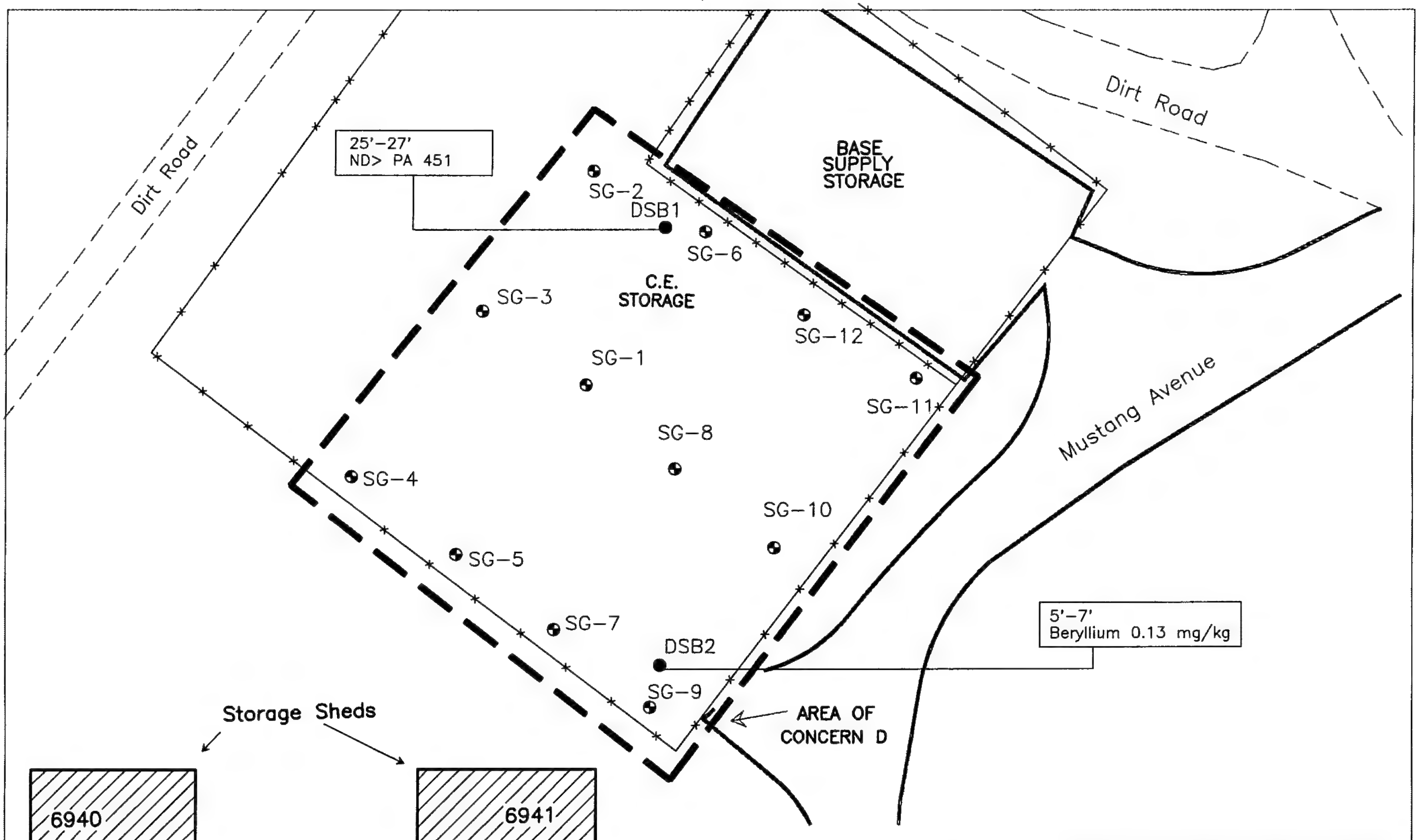
Bis(2-Ethylhexyl) phthalate was quantified in BCD-B1-2527 at a concentration of 540 μg/kg, while carbazole was detected from BCD-B2-0507 in a concentration of 55 μg/kg. No other SVOCs were found in the subsurface soil samples collected and analyzed from AOC D. Bis(2-Ethylhexyl) phthalate was not detected in a concentration greater than the generic industrial direct contact value or soil protective of groundwater value. Cleanup criteria for carbazole have not been established.

Metals

The metals arsenic, beryllium, chromium (total only), copper, lead, nickel, and zinc were quantified in the subsurface soils at AOC D. Of these seven metals, only beryllium, detected in a concentration of 0.13 mg/kg in sample BCD-B2-0507, was found in concentration which exceeds the soil protective of groundwater value of 0.08. The distribution of the metals detections which exceed the soil protective of groundwater values is presented in Figure 6-11.

6.6 AREA OF CONCERN E - OLD HANGAR (BUILDING 6901)

Field activities were completed at AOC E to acquire the necessary data to either confirm or deny the existence of contamination. The field activities consisted of a soil gas survey (21 samples; 19 locations numbered SG1 through SG19) followed by collection and analysis of surface and subsurface soil samples from borings ESB1 and ESB2. Total depths and screening and confirmation sampling intervals for the AOC E borings are presented in the following table.



LEGEND

SG-4 Soil Gas Sample Location

DSB1 Soil Boring Location

AOC "D" Boundary

Paved Road

Dirt Road

Fence

Storage Shed

ND > PA 451 = no compounds detected in concentrations greater than PA 451 Criteria

Scale 1"=40'

0 40 FEET

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AREA OF CONCERN D:
FORMER FIRE TRAINING AREA WEST
SUBSURFACE SOIL ANALYTICAL SUMMARY

8/95

FIGURE 6-11

FIG_6-11.dwg 8/95

Boring Number	Total Depth (feet bgs)	Field Screen Sample Intervals	Confirmation Sample Intervals
ESB1	32	5-7, 10-12, 15-17, 20-22, 25-27, and 30-32	0-2 and 30-32
ESB2	32	0-1, 5-7, 10-12, 15-17, 20-22, and 30-32	0-2 and 30-32

All AOC E sampling locations are presented in Figure 6-12. The results of these activities are presented in the following subsections.

6.6.1 Geology and Hydrogeology

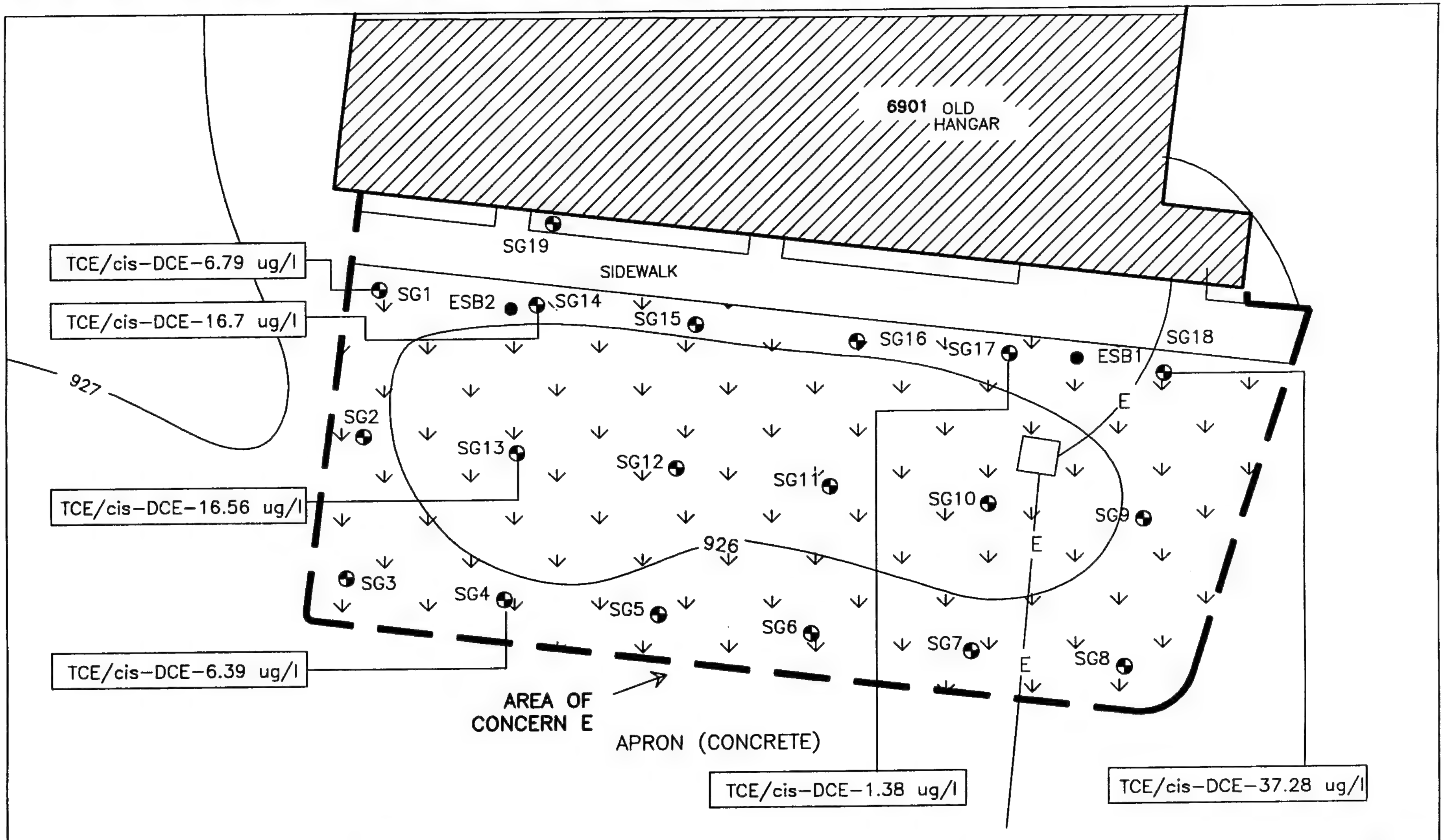
The soils beneath AOC E were described in the field as being composed of yellowish-brown, well-sorted, fine-grained sand, with or without trace amounts of gravel. No gravel layers were encountered in the subsurface beneath AOC E. Very moist sands, interpreted to indicate the top of the saturated zone, were encountered in the 30 to 32 ft sample interval obtained from boring ESB1. Groundwater flows to the northwest beneath AOC E (Figure 3.7).

6.6.2 Results of AOC E Screening Activities

The results of the soil gas and soil screening activities for AOC E are included in the following subsections.

6.6.2.1 Soil Organic Vapor Survey

The initial screening activities at AOC E consisted of collection and on-site analysis of 21 soil gas samples. The results are presented on Figure 6-12. Location ESG1 was vertically profiled. Samples ESG1a, b, and c were collected from the same location at depths of 5, 10, and 20 ft, respectively. TCE/cis - 1,2 - DCE in a concentration of 6.79 μg/l of air was detected in the 5 ft bgs sample. No target compounds or total VOCs were quantified in the 10 and 20 ft samples. Based on these data the remaining survey (locations ESG2 through ESG19) was completed at the 5 ft bgs depth interval. Of the 18 additional SOV samples



LEGEND

- SG4 Soil Gas Sample Location
- ESB1 Soil Boring Location
- AOC "E" Boundary
- Building
- E—E Electrical Utility with access box
- Grass
- 920 Topographic Elevation in Feet Above Mean Sea Level With Contour Lines Contour Interval = 1 Foot

N

Scale 1"=100'

0 100 FEET

*Note: If no result is shown then the sample contained no target compounds

E A R T H T E C H

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AREA OF CONCERN E:
BUILDING 6901 (OLD HANGAR)
SAMPLE LOCATIONS
AND SOIL GAS RESULTS (ug/l)
micrograms/liter

8/95

FIGURE 6-12

FIG_6-12.dwg 8/95 AREAE.DWG

collected after the analysis of ESG1a, b, and c at AOC E, TCE/cis-1,2-DCE was quantified in samples ESG4, ESG13, ESG14, ESG17, and SG18. The concentration of TCE/cis-1,2-DCE detected in these five samples ranged from 1.38 to 37.28 μg/l. The location of boring ESB1 was located between SOV samples ESG17 and ESG18, while boring ESB2 was located between ESG1 and ESG14. Each boring location was selected to confirm or deny the detections of TCE/cis-1,2-DCE found during completion of the SOV survey.

6.6.2.2 Soil Screening

Soil samples were collected from borings ESB1 and ESB2 at the surface and at 5 ft intervals until the water table was encountered. The 12 soil samples obtained from these borings were analyzed for their VOC content using the on-site GC. No target compounds or total VOCs were reported from the on-site analysis of these soils. These absence of target or total VOC detections, as quantified on the field GC, is consistent with the absence of field PID detections and the lack of noticeable hydrocarbon odors detected during the collection of the soil samples.

6.6.3 AOC E - Soil Analytical Results

A discussion of the analytical results obtained for the AOC E surface and subsurface soils is included in the following sections.

6.6.3.1 Surface Soil

The surface soil analytical results for AOC E are presented in Table 6-12 and are discussed by compound list and analyte type (VOCs, SVOCs, and metals) in the following subsections.

VOCs

Only the common laboratory contaminants, acetone (16 and 21 μg/kg) and/or methylene chloride (7 and 8 μg/kg) were detected in the surface soil samples collected and analyzed from

TABLE 6-12 AREA OF CONCERN E: BUILDING 6901 (OLD HANGAR) SURFACE SOIL ANALYTICAL RESULTS

LOCATOR:	ESB1		ESB2*	
SAMPLE ID:	BCE-B1-0002		BCE-B2-0002	
COLLECTION DATE:	07/12/94		07/12/94	
ASSOCIATED FIELD QC:	BCER8		BCER8	
PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL
CLP VOA (µg/kg)				
Acetone 7.4E+7/15,000	21	B	16	B
Methylene chloride 3.3E+6/100	8	JB	7	(B)
CLP METAL (mg/kg)				
Arsenic 83/7.14	5.90	N	6.50	
Beryllium 35/0.19	0.30	B	0.22	()
Chromium 1.0E+6/19.1	9.90	N	10	L
Chromium, Cr+6 (mg/l) 2.2E+4/--	0.02		0.02	
Copper 1.7E+5/32	9.30		6.20	
Lead 4.0E+2/21	9.10	*	6.90	
Nickel 3.4E+5/20	10		7.90	
Zinc 1.0E+6/48	24.10	EN	26	L

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000

mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
µg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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AOC E. Neither compound was detected in a concentration greater than their respective generic industrial direct contact values or soil protective of groundwater values.

SVOCs

No SVOCs were detected in the two surface soil samples collected and analyzed from AOC E.

Metals

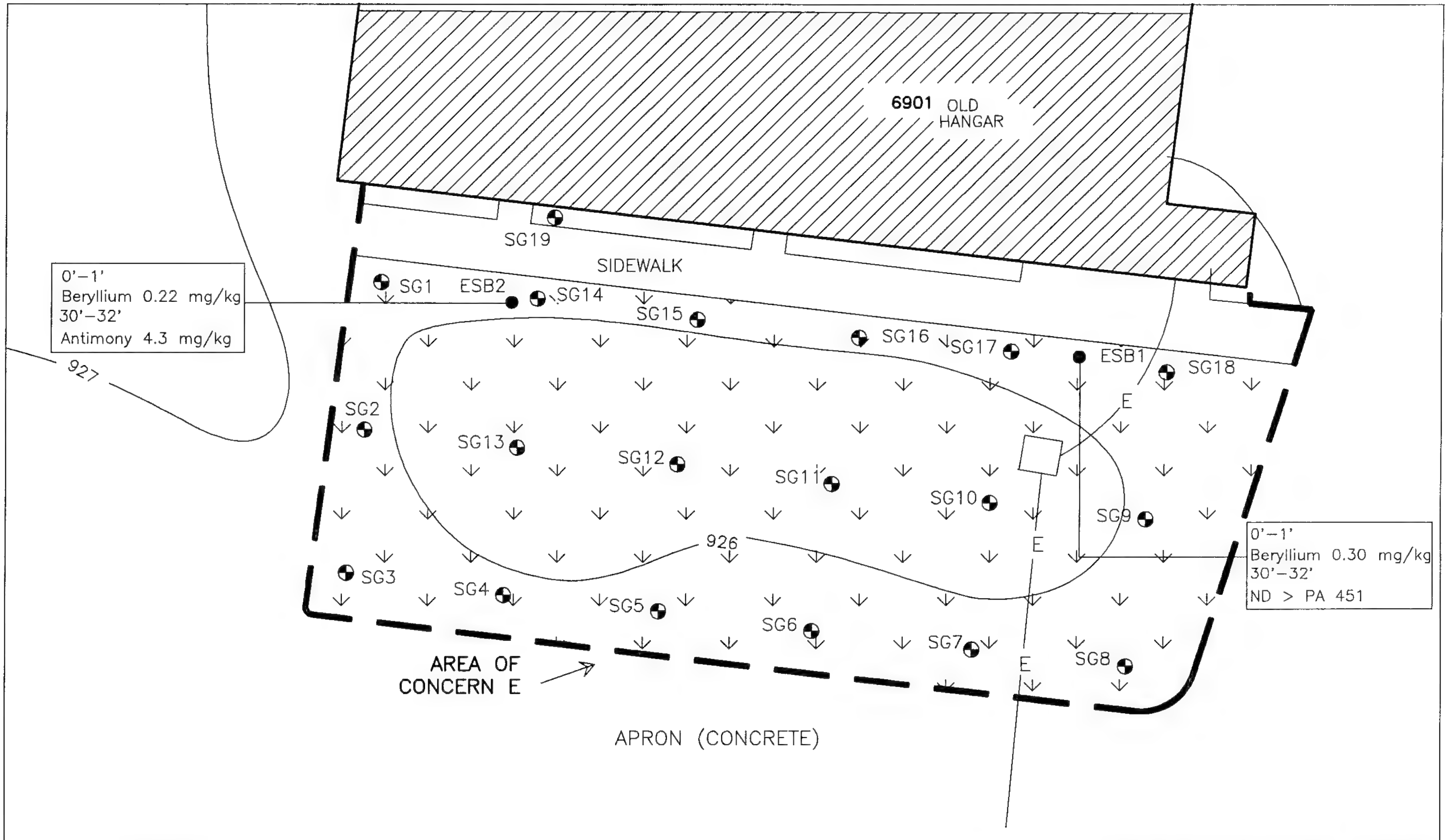
The metals, arsenic, beryllium, chromium (total and +6 valence), copper, lead, nickel, and zinc were quantified in the surface soil samples collected from AOC E. None of these metals were detected in concentrations exceeding their respective direct contact values. Only beryllium (0.3 and 0.22 mg/kg) was detected at a concentration which exceeds the soil protective of groundwater values of 0.08 mg/kg. These detections are illustrated on Figure 6-13.

6.6.3.2 Subsurface Soil

The soil analytical results for the two AOC E subsurface samples collected and analyzed during this SI are presented in Table 6-13, and are discussed by compound list and analyte type (VOCs, SVOCs, and metals) in the following subsections.

VOCs

Only the common laboratory contaminants acetone (30 μg/kg in each sample) and methylene chloride (12 and 16 μg/kg) were detected in both of the subsurface soil samples collected and analyzed from AOC E. Neither compound was detected in a concentration greater than their generic industrial direct contact values or soil protective of groundwater values.



LEGEND

- SG4 — Soil Gas Sample Location
- ESB1 — Soil Boring Location
- AOC "E" Boundary
- Building
- E — E Electrical Utility with access box
- Grass
- 920 — Topographic Elevation in Feet Above Mean Sea Level With Contour Lines Contour Interval = 1 Foot

ND > PA 451 = No Detection Greater than PA 451 Criteria

N

Scale 1"=100'

0 — 100 FEET

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AREA OF CONCERN E: BUILDING 6901 (OLD HANGAR) SOIL SAMPLE ANALYSIS SUMMARY

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FIGURE 6–13

FIG_6–13.DWG 8/95 AREAE.DWG

TABLE 6-13 AREA OF CONCERN E: BUILDING 6901 (OLD HANGAR) SUBSURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		ESB1		ESB2	
SAMPLE ID:		BCE-B1-3032		BCE-B2-3032	
COLLECTION DATE:		07/12/94		07/12/94	
ASSOCIATED FIELD QC:		BCER8		BCER8	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL
CLP VOA ($\mu g/kg$)					
Acetone	7.4E+7/15,000	30	B	30	B
Methylene chloride	3.3E+6/100	12	B	16	B
CLP METAL (mg/kg)					
Antimony	1,600/0.36	3.40	UN	4.30	*
Arsenic	83/6.57	4.70	AN	3.80	N
Chromium	1.0E+6/18	5.10	N	5	*
Copper	1.7E+5/32	3.90		3.90	
Lead	4.0E+2/21	2.70	*	2.80	N
Nickel	3.4E+5/20	7.90		5.30	*
Zinc	1.0E+6/48	17.20	EN	20.20	E

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000
mg/kg milligrams/kilogram
$\mu g/kg$ micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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SVOCs

No SVOCs were detected in the two subsurface soil samples collected and analyzed from AOC E.

Metals

Seven metals, as listed on Table 6-13, were quantified in either one or both subsurface soil samples collected and analyzed from AOC E. The metals and their corresponding concentrations are antimony (one detection; 4.3 mg/kg), arsenic (3.8 and 4.7 mg/kg), chromium (total - 5 and 5.1 mg/kg), copper (3.9 mg/kg in each sample), lead (2.7 and 2.8 mg/kg), nickel (5.3 and 7.9 mg/kg), and zinc (17.2 and 20.2 mg/kg). None of the metals were detected in a concentration which exceeds its respective generic industrial direct contact values. Antimony (4.3 mg/kg) was detected above its soil protective of groundwater value of 0.36 mg/kg in sample BCE-B2-3032. The detection of antimony is presented in Figure 6-13.

6.7 AREA OF CONCERN F - NEW HANGAR (BUILDING 6900)

Field activities were completed at AOC F to acquire the necessary data to either confirm or deny the existence of contamination. The field activities were limited to the collection and analysis of subsurface soil samples from borings FSB1, FSB2, and FSB3. Total depths and screening and confirmation sampling intervals for AOC F are presented in the following table.

Boring Number	Total Depth (feet bgs)	Field Screen Sample Intervals	Confirmation Sample Intervals
FSB1	37	1-3, 5-7, 10-12, 15-17, 20-22, 25-27, 30-32 and 35-37	1-3 and 30-32
FSB2	32	1-3, 5-7, 10-12, 15-17, 20-22, 25-27, and 30-32	1-3 and 30-32
FSB3	32	1-3, 5-7, 10-12, 15-17, 20-22, 25-27 and 30-32	1-3, 5-7, and 30-32

All AOC F sampling locations are presented in Figure 6-14. The results of these activities are presented in the following subsections.

6.7.1 Geology and Hydrogeology

The soils beneath AOC F can generally be described as being composed of brown to yellowish-brown, well-sorted, fine-grained sand. A lens of well-sorted, medium to coarse-grained sand was encountered in borings FSB1 and FSB2. The top of this lens occurred at a depth of 10 ft bgs and extend to approximately 17 ft bgs in FSB1 and to approximately 19 ft bgs in FSB2. No gravel layers were encountered in the subsurface beneath AOC F. Wet sands, interpreted to indicate the top of the saturated zone, were encountered in the 35 to 37 ft sample interval obtained from boring FSB1. Groundwater flow is toward the northwest beneath AOC F (Figure 3-7).

6.7.2 Soil Screening

Soil samples were collected from borings FSB1, FSB2, and FSB3 from just under the asphalt cover and at 5 ft intervals until the water table was encountered. The 22 soil samples obtained from these borings were analyzed for their VOC content using the on-site GC. No target compounds or total VOCs were reported from the on-site analysis of these soils. These absence of target or total VOC detections, as quantified on the field GC, is consistent with the absence of field PID detections and the lack of noticeable hydrocarbon odors detected during the collection of the soil samples.

6.7.3 AOC F - Soil Analytical Results

A discussion of the analytical results obtained for the AOC F subsurface soils is included in the following sections.

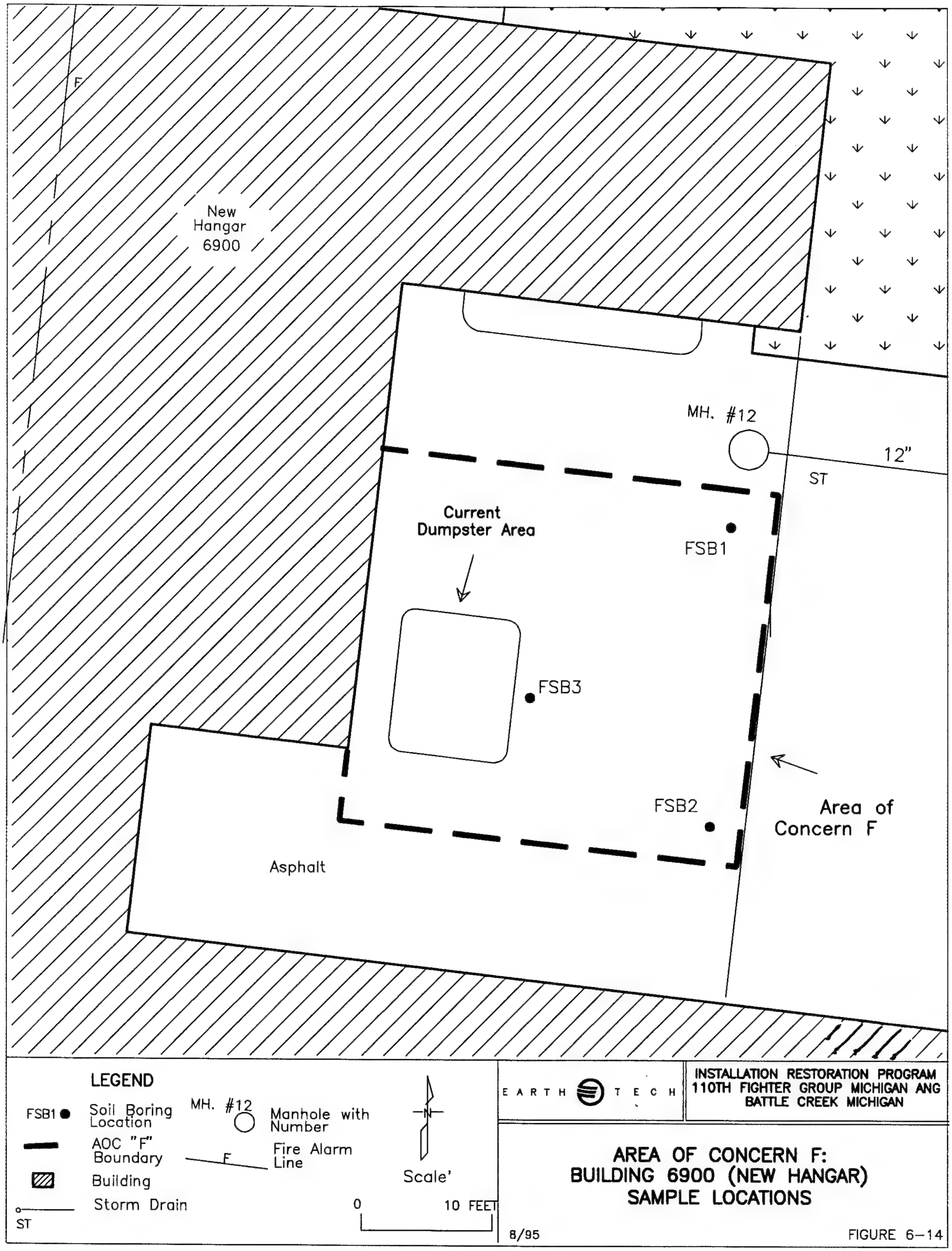

FIG_ 6–14.dwg 8/95

Subsurface Soil

The soil analytical results for the seven AOC F subsurface samples collected and analyzed during this SI are presented in Table 6-14, and are discussed by compound list and analyte type (VOCs, SVOCs, and metals) in the following subsections.

VOCs

Acetone and methylene chloride, (both common laboratory contaminants) and chlorobenzene were all detected in one or more of the seven subsurface soil samples collected and analyzed from AOC F. Methylene chloride was detected in a concentration of 130 μg/kg (greater than the soils protective of groundwater values) in one sample, the 1 to 3 ft interval collected from FSB2. This result was qualified B by the laboratory which indicates some type of blank contamination. Acetone was detected in three samples at relatively low concentrations (18 to 45 μg/kg). Acetone was not detected at a concentration exceeding the soils protective of groundwater values or generic industrial direct contact values. Chlorobenzene was detected only in sample BCF-B1-0103 at a concentration of 1 μg/kg, which is below the soils protective of groundwater values or generic industrial direct contact criteria.

SVOCs

Eleven individual SVOCs were detected in the subsurface soil samples, including compounds from the PAHs and phthalate ester groups. SVOCs were more common in the 1 to 3 ft bgs samples than the deeper subsurface samples. Individual SVOCs, when detected, were quantified in concentrations ranging from 38 to 150 μg/kg. Total PAHs concentrations, obtained by summing the concentrations of individual PAHs, range from 258 μg/kg in BCF-B2-0103 to 869 μg/kg in BCF-B3-0103. No SVOCs were detected in a concentration exceeding their respective soils protective of groundwater values or generic industrial direct contact values.

TABLE 6-14 AREA OF CONCERN F: BUILDING 6900 (NEW HANGAR) SUBSURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		FSB1		FSB1		FSB2		FSB2		FSB3*		FSB3	
SAMPLE ID:		BCF-B1-0103		BCF-B1-3032		BCF-B2-0103		BCF-B2-3032		BCF-B3-0103		BCF-B3-0507	
COLLECTION DATE:		06/29/94		06/29/94		06/29/94		06/30/94		07/14/94		07/14/94	
ASSOCIATED FIELD QC:		BCER8		BCER8		BCER8		BCER8		BCER8		BCER8	
	PA451 PART 201 CRITERIA (b)	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
CLP VOA (µg/kg)													
Acetone	7.4E+7/15,000	11	U	10	U	11	U	18	B	45		39	
Chlorobenzene	1.4E+7/2,000	1	J	10	U	11	U	11	U	11	U	11	U
Methylene chloride	3.3E+6/100	11	B	16	B	130	B	5	JB	8	JB	10	(B)
CLP SVOA (µg/kg)													
Benzo(a)anthracene	2.1E+5/--	360	U	340	U	38	J	350	U	68	J	340	U
Benzo(a)pyrene	21,000/--	360	U	340	U	350	U	350	U	69	J	340	U
Benzo(b)fluoranthene	2.1E+5/--	46	XJ	340	U	65	XJ	350	U	130	XJ	340	U
Benzo(k)fluoranthene	2.1E+6/--	47	XJ	340	U	65	XJ	350	U	140	XJ	340	U
Chrysene	2.1E+7/--	47	J	340	U	37	J	350	U	73	J	340	U
Di-n-butyl phthalate	5.4E+8/18,000	360	U	340	U	350	U	350	U	64	J	96	()
Fluoranthene	5.4E+8/18,000	74	J	340	U	65	J	350	U	150	J	340	U
Indeno(1,2,3-cd)pyrene	2.1E+5/--	360	U	340	U	350	U	350	U	43	J	340	U
Phenanthrene	1.6E+7/520	120	J	340	U	350	U	350	U	86	J	340	U
Pyrene	3.4E+8/11,000	59	J	340	U	53	J	350	U	110	J	340	U
bis(2-Ethylhexyl)phthalate	1.1E+7/--	170	JB	83	JB	91	JB	240	JB	50	J	38	()
CLP METAL (mg/kg)													
Antimony	1,600/0.36	3.30	UN	3.10	UN	3.20	UN	3.20	UN	3.20	U*	3.20	U
Arsenic	83/6.57	4.70	N	4.40	N	5.30	N	4	N	5.70	N	8.10	
Beryllium	35/0.08	0.33	B	0.14	B	0.14	B	0.15	B	0.31	B	0.22	()
Chromium	1.0E+6/18	12.40	N	5.50	N	8.80	N	5.40	N	11.70	*	6.30	
Chromium, Cr+6 (mg/l)	2.2E+4/--	0	U	0	U	0.01		0	U	0.06		0	U
Copper	1.7E+5/32	7.40		4.30		5		3.90		7.10		6.60	
Lead	4.0E+2/21	9.70	*	3.40	*	4.70	*	2.80	*	8.40	N	3.40	L
Nickel	3.4E+5/20	9.30		6.80		7.80		8.70		8.80	*	6	
Zinc	1.0E+6/48	23	EN	15.80	EN	18.40	EN	16.80	EN	28.10	E	18	

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000

mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
µg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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TABLE 6-14 AREA OF CONCERN F: BUILDING 6900 (NEW HANGAR) SUBSURFACE SOIL ANALYTICAL RESULTS

LOCATOR:		FSB3	
SAMPLE ID:		BCF-B3-3032	
COLLECTION DATE:		07/14/94	
ASSOCIATED FIELD QC:		BCER8	
	PA451 PART 201 CRITERIA	RESULT	QUAL
CLP VOA (µg/kg)			
Acetone	7.4E+7/15,000	10	U
Chlorobenzene	1.4E+7/2,000	10	U
Methylene chloride	3.3E+6/100	5	JB
CLP SVOA (µg/kg)			
Benzo(a)anthracene	2.1E+5/--	340	U
Benzo(a)pyrene	21,000/--	340	U
Benzo(b)fluoranthene	2.1E+5/--	340	U
Benzo(k)fluoranthene	2.1E+6/--	340	U
Chrysene	2.1E+7/--	340	U
Di-n-butyl phthalate	5.4E+8/18,000	140	J
Fluoranthene	5.4E+8/18,000	340	U
Indeno(1,2,3-cd)pyrene	2.1E+5/--	340	U
Phenanthrene	1.6E+7/520	340	U
Pyrene	7.4E+5/11,000	340	U
bis(2-Ethylhexyl)phthalate	1.1E+7/--	53	J
CLP METAL (mg/kg)			
Antimony	1,600/0.36	3.40	*
Arsenic	83/6.57	7.50	AN
Beryllium	35/0.08	0.11	U
Chromium	1.0E+6/18	4.30	*
Chromium, Cr+6 (mg/l)	2.2E+4/--	0	U
Copper	1.7E+5/32	4.70	
Lead	4.0E+2/21	3.10	N
Nickel	3.4E+5/20	6.50	*
Zinc	1.0E+6/48	16.10	E

1.0E+3 is abbreviated scientific notation and is equivalent to 1,000

mg/kg milligrams/kilogram
mg/ℓ milligrams/liter
µg/kg micrograms/kilogram
* Sample validated using HAZWRAP level C QC
(b) generic industrial direct contact value/soil protective of groundwater action level

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Value is unreliable due to blank contamination value
J Reported value is estimated
L Reported value is biased low
U Compound analyzed for but not detected
R Result is unreliable

Laboratory Qualifiers
A Result produced from a single point method-of-standard addition
B Analyte also detected in associated blank (organic)
B Result between IDL and CRDL (inorganic)
E Chemical or physical interference during analysis
J Reported value is estimated
N Matrix related interference in the sample
U Compound analyzed for but not detected
X Sample specific qualifier
* Non-homogeneous sample matrix

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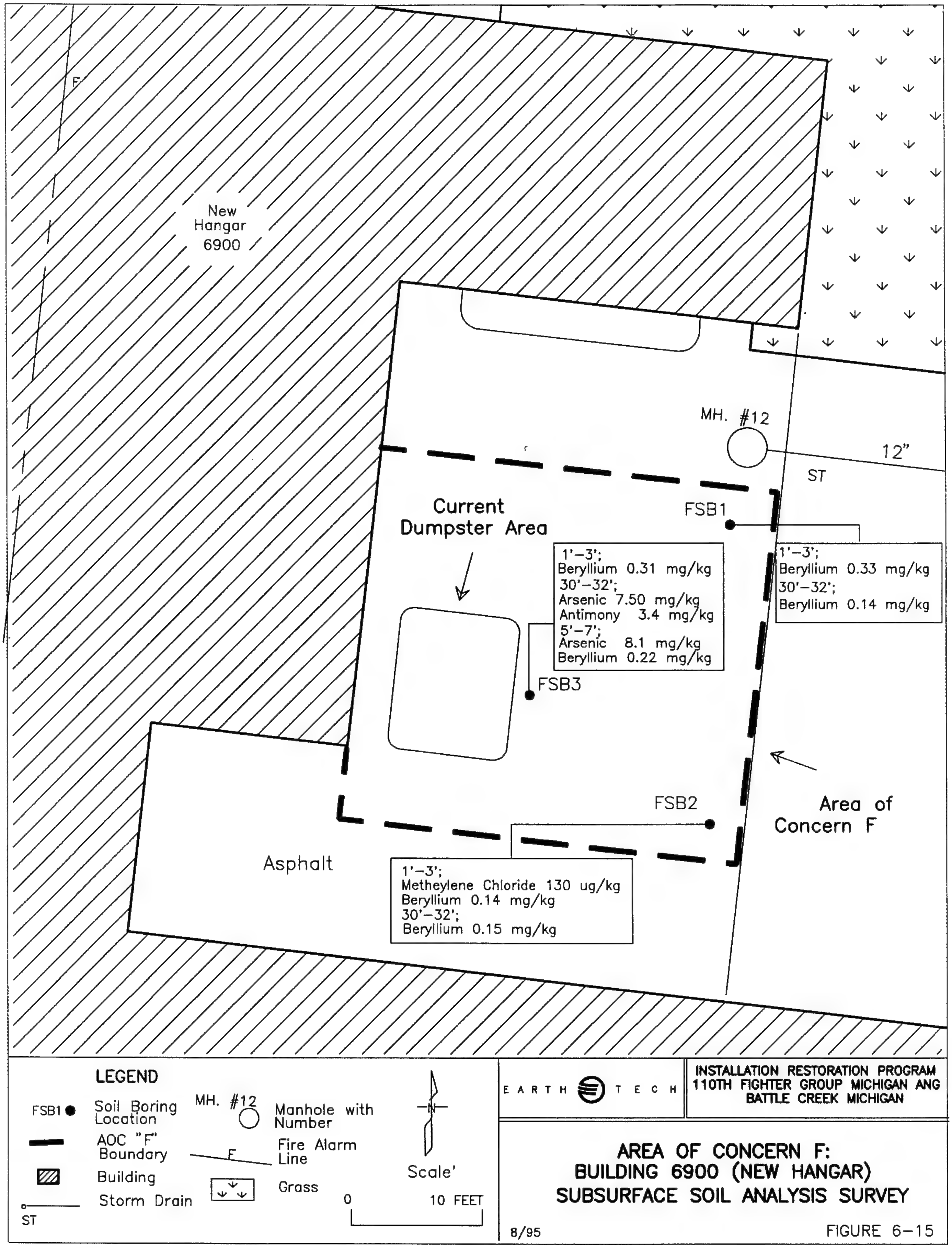
Metals

The metals antimony, arsenic, beryllium, chromium (total and +6), copper, lead, nickel, and zinc were detected in the subsurface soils at AOC F. Antimony (one detection) and chromium +6 (two detections) were detected infrequently in the data set. The remaining metals, arsenic, beryllium, chromium, copper, lead, nickel, and zinc were detected more frequently in the data set (six to seven samples). No metals were detected in concentrations which exceed the generic industrial direct contact values. Arsenic was detected in concentrations which exceeds its soils protective of groundwater values in samples BCF-B3-0507 (8.1 mg/kg) and BCF-B3-3032 (7.5 mg/kg). Antimony was detected above its soils protective of groundwater values of 0.36 mg/kg in sample BCF-B3-3032 in a concentration of 3.4 mg/kg. Beryllium was detected in six of the seven AOC F samples in concentrations ranging from 0.14 to 0.33 mg/kg, and in excess of the soils protective of groundwater value of 0.08 mg/kg. The distribution of the metals detections which exceed soils protective of groundwater criteria for the subsurface soils is presented on Figure 6-15.



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BUILDING 6900 (NEW HANGAR)
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FIGURE 6–15

FIG_6–15.dwg 8/95

7.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

7.1 GENERAL

A PA, consisting of a records search and personnel interviews, was completed for the base. This PA was supplemental to the existing PA (HMTC operated by Dynamac Corporation, 1987). Based on the results of the PA, a field program (SI) was initiated to confirm or deny the existence of environmental contamination for six AOC. The field program focused on soil sampling and analysis.

All media-specific VOC, SVOC, and metals chemical analyses were compared to the lowest of their applicable NREPA PA 451 interim generic industrial direct contact or soil protective of groundwater values. This analysis provided a process to preliminarily identify whether additional remedial actions may be warranted at an AOC.

7.2 AOC A

A summary of the data collected during the SI, conclusions based on these data, and recommendations regarding the disposition of AOC A are included in the following sections.

7.2.1 Summary

The former waste accumulation area was located inside the fenced-in area housing vehicle refueling operations. This facility was used as a waste POL and solvent collection and storage area from the 1960s to the early 1980s. Past spills of waste POL/solvents were reported by base personnel during waste handling procedures at AOC A. SI sampling activities included a SOV survey in the area the drums were stored and surface and subsurface soil sampling and analysis.

Surface Soils

No VOCs were detected above the applicable NREPA PA 451 cleanup criteria for surface soils. Phenanthrene, a SVOC, was detected in the surface soils in concentrations exceeding its soil protective of groundwater value, indicating a potential threat to the groundwater. Antimony, arsenic, barium, beryllium, chromium (total), lead, and zinc were quantified in one or more samples at a concentration which exceeds the soil protective of groundwater value for each particular metal. These data also indicate a potential threat to groundwater. No compounds were detected in the soil samples in concentrations which exceed generic industrial direct contact values.

Subsurface Soils

Methylene chloride was detected within the subsurface soil at a concentration which exceeds its residential 20x health-based drinking water criteria, indicating a potential threat to the groundwater. However, methylene chloride is a common laboratory contaminant and the result presented in this report was qualified B by the laboratory which indicates some type or blank contamination. Although SVOCs (PAHs) were detected in the subsurface soil samples, no SVOCs were detected in the subsurface soil samples in concentrations exceeding applicable NREPA PA 451 cleanup criteria. Arsenic, lead, and nickel were detected above their respective soil protective of groundwater values. No compounds were detected in the soil samples in concentrations which exceed generic industrial direct contact values.

7.2.2 Conclusions

The PAHs and metals concentrations quantified during the SI indicate that past spills of waste POL/solvents have occurred at AOC A. The extent of these compounds, particularly in the surface soils has not been determined. Soil protective of groundwater values were exceeded in both the surface and subsurface soils. Average surface and subsurface soil concentrations for the compounds detected above the soil protective of groundwater values are presented in the following table:

	Average concentration (a)		Soil protective of groundwater value		Average concentration exceeds value?
	surface soil	subsurface soil	surface soil	subsurface soil	
Methylene chloride	NA	89	NA	100	No
Phenanthrene	3,203	NA	520	NA	Yes
Antimony	4.45	2.48	0.36	0.36	Yes/Yes
Arsenic	12.47	28.67	7.14	6.57	Yes/Yes
Barium	55.83	NA	76.43	NA	No
Beryllium	0.29	0.08	0.19	0.08	Yes/No
Chromium	11.36	NA	19.10	NA	No
Lead	49.48	12.83	21	21	Yes/No
Nickel	NA	102.88	NA	20	Yes
Zinc	54.32	NA	48	NA	Yes

NA - not applicable

metals concentrations are presented in mg/kg; organic compounds concentrations are presented in μg/kg

(a) one-half of the reported value was used for non-detects; field duplicate concentrations were averaged prior to computing average AOC concentrations

Average surface soil concentrations for phenanthrene, antimony, arsenic, beryllium, lead, and zinc and subsurface soil concentrations for antimony, arsenic, and nickel exceed their respective soil protective of groundwater values, suggesting a potential threat to the groundwater exists from these soils.

7.2.3 Recommendations

It is recommended to subject AOC A surface and subsurface soil samples to leachate testing to determine if the potential threat to the groundwater is substantiated by leachate testing. Leachate testing should be completed for the SVOCs and metals listed in the previous subsection of this report using procedures approved by the MDNR (O.M. #12, revision 2, January 1995).

7.3 AOC B

A summary of the data collected during the SI, conclusions based on these data, and recommendations regarding the disposition of AOC B are included in the following sections.

7.3.1 Summary

The Motor Pool Drainage Ditch received runoff from the motor pool and areas adjoining the motor pool and directed these surface waters to the drainage swale (IRP Site 2) from 1963 to the present. The occurrence of organic compounds and metals in sampling results from the outfall of the ditch (ES, Nov. 1993), stained soils observed during construction activities in the ditch, and the reports of waste JP-4 jet fuel and POL entering the ditch from the motor pool led to the inclusion of the ditch in the SI. SI sampling activities included a SOV survey along the length of the ditch and the sampling and analysis of four soil borings.

<u>Surface Soils</u>

No VOCs were detected above the applicable NREPA PA 451 cleanup criteria for surface soils. Phenanthrene, a SVOC, was detected in the surface soils in concentrations exceeding the residential 20x health-based drinking water value. Metals were also detected in the surface soils in concentrations exceeding their respective soil protective of groundwater values. Concentrations of antimony, arsenic, cadmium, chromium (total), lead, and zinc exceed the soil protective of groundwater value in one or more samples, suggesting a potential threat to

groundwater. No compounds were detected in the soil samples in concentrations which exceed generic industrial direct contact values.

Subsurface Soils

No VOCs or SVOCs were detected within the subsurface soils at concentrations exceeding their respective NREPA PA451 cleanup criteria. Metals were detected above applicable NREPA PA 451 criteria in the subsurface soils. Concentrations of antimony, arsenic, beryllium, mercury, and nickel exceed the soil protective of groundwater values for these individual metals, suggesting a potential threat to the groundwater. No compounds were detected in the soil samples in concentrations which exceed generic industrial direct contact values.

7.3.2 Conclusions

The PAHs and metals concentrations quantified during the SI suggest that contaminated surface runoff could have been carried by the ditch in the past. The occurrence of these compounds in the surface soils may be due to reworking of the soil during construction and installation of the storm sewer.

VOC and SVOC subsurface soil analytical results indicate that the soils beneath the ditch have not been adversely affected by the infiltration of wastes or waste waters containing solvents and/or POL. Metals concentrations in the soils may be elevated due to past waste handling practices.

Preliminary results indicate that similar contaminant profiles exist in the surface soils at Sites 1 and AOC B. These areas are geographically continuous. The origin of the organic and inorganic contaminants detected in the surface soils at AOC B may be related to the contaminants detected in the Site 1 soils.

7.3.3 Recommendations

AOC B was included with Site 1 in the Internal Draft RI Report (EARTH TECH, June 1995). It is recommended to continue the evaluation of AOC B through the RI process.

7.4 AOC C

A summary of the data collected during the SI, conclusions based on these data, and recommendations regarding the disposition of AOC C are included in the following sections.

7.4.1 Summary

A former FTA, consisting of two separate bermed areas, was located on airport property immediately south of the base. These FTAs were used from approximately 1965 to 1967. An estimated 5,400 to 7,200 gallons of waste POL were used during fire training exercises. SI sampling activities included a SOV survey across both bermed areas, surface and subsurface soil sampling within each bermed area, and field and laboratory analysis of groundwater samples.

<u>Surface Soils</u>

No VOCs or SVOCs were detected above the NREPA PA 451 cleanup criteria for surface soils. Arsenic and beryllium were detected in the surface soils in concentrations exceeding their soil protective of groundwater values. No compounds were detected in the soil samples in concentrations which exceed generic industrial direct contact values.

<u>Subsurface Soils</u>

No VOCs, or PCBs were detected within the subsurface soils at concentrations exceeding their respective NREPA PA 451 cleanup criteria. One soil sample containing high levels of petroleum hydrocarbons (quantified as TICs on the SVOC GC/MS analysis), was obtained from the subsurface soils. TCLP extract concentrations (semi-volatile list only) were non-detect on

this soil sample. Analytical results from borings CSB1, -SB2, -SB5, -SB6 and -SB7 (surrounding the hydrocarbon - containing soils) indicate that the extent of the soils containing these relatively high concentrations of hydrocarbons were delineated during the SI. Antimony, arsenic, and nickel concentrations exceed the soil protective of groundwater values, suggesting a threat to the groundwater. No compounds were detected in the soil samples in concentrations which exceed generic industrial direct contact values.

Groundwater

Groundwater analytical results from one sample collected immediately beneath the hydrocarbon-containing soil show that no VOCs, SVOCs, and metals were detected above interim residential health-based drinking water values.

7.4.2 Conclusions

Residual hydrocarbons indicative of past fire training exercises were detected in the soils and groundwater beneath AOC C. Based on the analytical results obtained during this SI, the lateral and vertical extent of hydrocarbon-containing soils has been delineated. TCLP extract concentrations (semi-volatile list only) show that these SVOCs should not leach from the hydrocarbon-containing soils in concentrations which would be detrimental to groundwater quality. Relatively low concentrations of four organic compounds (0.8 to 4 μg/l) were detected in the groundwater sample collected and submitted for laboratory analysis from AOC C. The groundwater analytical results for VOCs, SVOCs, and metals indicate that although affected, groundwater quality beneath AOC C has not been impacted to the extent that the interim residential health-based drinking water values in the source area have been exceeded. The metals detected in soil samples may be elevated due to past fire training exercises.

Average concentrations for arsenic and beryllium in the surface soils and antimony, arsenic, and nickel in the subsurface soils are presented in the following table:

	Average concentration (a)		Soil protective of groundwater value		Average concentration exceeds value?
	surface soil	subsurface soil	surface soil	subsurface soil	
Antimony	NA	2.24	NA	0.36	Yes
Arsenic	3.55	3.16	7.14	6.57	No/No
Beryllium	0.078	NA	0.19	NA	No
Nickel	NA	13.2	NA	20	No

NA - not applicable

metals concentrations are presented in mg/kg;

(a) one-half of the reported value was used for non-detects; field duplicate concentrations were averaged prior to computing average AOC concentrations

As shown in this table only antimony was present in the subsurface soils in an average concentration which exceeds the soil protective of groundwater value. Unlike AOC A where soils containing metals above the soil protective of groundwater values are associated with hydrocarbons, the antimony detections present at AOC C which exceed the soil protective of groundwater values are located outside of the area where the soils contain hydrocarbons. Therefore, these detections are considered outliers and may be due to natural variation of the metals content of the soils.

7.4.3 Recommendations

No further actions are recommended for AOC C.

7.5 AOC D

A summary of the data collected during the SI, conclusions based on these data, and recommendations regarding the disposition of AOC D are included in the following sections.

7.5.1 Summary

This FTA was used once in 1972 to burn a damaged aircraft prior to its being shipped off-base for disposal. The area is located west of Building 6909, within the boundaries of IRP Site 5. An estimated 1,800 to 2,400 gallons of waste POL/solvents were used at this location. SI sampling activities included a SOV survey across the area and surface and subsurface soil sampling.

No VOCs or SVOCs were detected above the applicable NREPA PA 451 cleanup criteria for surface and subsurface soils collected and analyzed during the SI. Arsenic, beryllium, mercury, and zinc were detected in either the surface or subsurface soil samples in concentrations exceeding their respective soil protective of groundwater values. No compounds were detected in the soil samples in concentrations which exceed generic industrial direct contact values.

7.5.2 Conclusions

No VOCs or SVOCs indicative of residual contamination from past fire training exercises were detected in the soils collected and analyzed during the SI. The surface of AOC D is proposed for soil stabilization and capping as part of the Source Removal Action Plan (SRAP - The Earth Technology Corporation, June 1994). No data collected during this SI would indicate that alternative or additional interim remedial measures are needed across AOC D.

7.5.3 Recommendations

No further remedial actions, beyond what are proposed during the SRAP (The Earth Technology Corporation, June 1994) are recommended for AOC D.

7.6 AOC E

A summary of the data collected during the SI, conclusions based on these data, and recommendations regarding the disposition of AOC E are included in the following sections.

7.6.1 Summary

Prior to construction of the new hangar (1962), aircraft maintenance activities were housed in the old hangar (Building 6901). After 1962, the old hangar was used for vehicle maintenance and aircraft parts painting operations. A grassy area existing between the hangar and the apron was suspected of being an area where small amounts of shop wastes were disposed of. SI sampling activities completed in this grassy area included a SOV survey and surface and subsurface soil sampling.

No VOCs were detected above their applicable NREPA PA 451 cleanup criteria for surface and subsurface soils collected and analyzed during the SI. No detections of SVOCs were reported in the data set. Beryllium (surface soils) and antimony (subsurface soils) were each detected in concentrations exceeding their respective soil protective of groundwater values, indicating a potential threat to groundwater. No compounds were detected in the soil samples in concentrations which exceed generic industrial direct contact values.

7.6.2 Conclusions

No VOCs or SVOCs indicative of the disposal of waste POL or solvents were detected in the soils at concentrations above applicable NREPA PA 451 cleanup criteria. Average on-site concentrations for the metals antimony (subsurface soils) and beryllium (surface soils) are presented in the following table:

	Average concentration (a)		Soil protective of groundwater value		Average concentration exceeds value?
	surface soil	subsurface soil	surface soil	Subsurface soil	
Antimony	NA	3.05	NA	0.36	Yes
Beryllium	0.26	NA	0.19	NA	Yes

NA - not applicable

metals concentrations are presented in mg/kg;

(a) one-half of the reported value was used for non-detects

As shown on this table average antimony and beryllium concentrations exceed the soil protective groundwater values. This evaluation suggests the presence of antimony (subsurface soils) and of beryllium (surface soils) poses a potential threat to the groundwater beneath AOC E. Unlike AOC A where soils containing metals above the soil protective of groundwater value are associated with hydrocarbons, these elevated metals concentrations are not associated with organic compounds suggestive of past spills or the disposal of potentially hazardous materials. These metals detections are considered outliers and not likely the result of spills or the disposal of potentially hazardous substances.

7.6.3 Recommendations

No further actions are recommended for AOC E.

7.7 AOC F

A summary of the data collected during the SI, conclusions based on these data, and recommendations regarding the disposition of AOC F are included in the following sections.

7.7.1 Summary

AOC F, the new hangar (Building 6900) has housed aircraft maintenance operations since the facility was constructed in 1962. Small quantities of used solvent, and waste paint and POL were disposed of in the dumpsters. The dumpsters reportedly leaked. Stained soils were also reported beneath the dumpsters. As part of the SI, subsurface soil sampling and analysis were completed in the alcove which contains the dumpsters.

Methylene chloride was detected within the subsurface soils at a concentration exceeding its 20 x residential health-based drinking water cleanup criteria, indicating a potential threat to the groundwater. However, methylene chloride is a common laboratory contaminant and the result presented in this report was qualified B by the laboratory which indicates some type or blank contamination. SVOCs (PAHs) were detected in the subsurface soil samples. No

SVOCs were detected in the subsurface soil samples in concentrations exceeding applicable NREPA PA 451 cleanup criteria. Antimony, arsenic, and beryllium were detected above their respective soil protective of groundwater criteria in the subsurface soils. No compounds were detected in the soil samples in concentrations which exceed generic industrial direct contact values.

7.7.2 Conclusions

VOCs or SVOCs were detected in the soils collected and analyzed during the SI. The detection of these compounds suggests they may be due to the disposal of waste POL or solvents. However, the only VOC or SVOC detected in concentrations exceeding the 20x residential health-based drinking water value is methylene chloride. Methylene chloride was reportedly used by the non-destructive interference shop, which is currently located in this hangar. Although methylene chloride is considered a common laboratory contaminant, its use in the new hangar suggests that it may have originated from disposal or waste handling activities. This area is covered by asphalt and receives very little if any direct surface infiltration. In addition, the methylene chloride was quantified in the 1 to 3 ft bgs interval, but not in the 30 to 32 ft bgs interval from FSB2. These results suggest that the compound is not moving vertically down through the soil column. The methylene chloride detection in the shallow subsurface soils, although detected in a concentration exceeding the 20x health-based drinking water value, is not considered a significant threat the shallow groundwater beneath AOC F. Metals concentrations may be elevated due to past waste handling activities. Average subsurface soil concentrations for antimony, arsenic, and beryllium are included in the following table:

	Average concentration (a)		Soil protective of groundwater value		Average concentration exceeds value?
	surface soil	subsurface soil	surface soil	subsurface soil	
Antimony	NA	1.86	NA	0.36	Yes
Arsenic	NA	5.7	NA	6.57	No
Beryllium	NA	0.19	NA	0.08	Yes

NA - not applicable
metals concentrations are presented in mg/kg;
(a) one-half of the reported value was used for non-detects

As shown on this table, average antimony and beryllium concentrations exceed their respective soil protective of groundwater values. This evaluation suggests the presence of antimony and beryllium in the subsurface soils poses a potential threat to the groundwater beneath AOC F. However, the area is covered by asphalt and receives very little, if any, direct surface infiltration. This significantly reduces the potential mobility of these metals.

7.7.3 Recommendations

No further actions are recommended for AOC F.

8.0 BIBLIOGRAPHY

Air Force Center for Environmental Excellence, Completion of One-Year Bioventing Test, IRP Site 3. 110th FG, MIANG, May 17, 1994.

Camp Dresser and McKee, Springfield Wells Site Final Technical Memorandum, June 1992.

Earth Technology Corporation, Final PA/SI Work Plan, 110th FG, MIANG, Battle Creek, Michigan, March 1994.

Earth Technology Corporation, Draft Final RI Work Plan, 110th FG, MIANG, Battle Creek, Michigan, September 1994.

Earth Technology Corporation, Final Source Removal Action Plan, Site 5 - Coal Storage Area, 110th FG, Michigan ANG, W.K. Kellogg Airport, Battle Creek, Michigan, June 1994.

Earth Technology Corporation, Internal Draft RI Report, 110th FG, MIANG, Battle Creek, Michigan, June 1995.

Engineering-Science, IRP Draft Immediate Response Report: 110th TASG, Michigan ANG, 1988.

Engineering-Science, Part I Bioventing Pilot Test Work Plan and Part II Draft Interim Pilot Test Results for IRP Site 3, Battle Creek ANG, Michigan, November 1992.

Engineering-Science, Final Site Investigation Report, 110th TASG, Michigan Air National Guard, W.K. Kellogg Regional Airport, Battle Creek, Michigan, November 1993.

Engineering-Science, Draft Final Source Removal Action Plan, Site 2 - Drainage Swale, 110th Fighter Group, Michigan Air National Guard, W.K. Kellogg Airport, Battle Creek, Michigan, (June, 1994).

Engineering-Science, Site 5: Soil Sampling and Analysis, 110th Fighter Group, Michigan Air National Guard, March 1993.

Engineering-Science, Final Site Investigation Report, 110th TASG, Michigan Air National Guard, W.K. Kellogg Regional Airport, Battle Creek, Michigan, November 1993.

Grannemann and Twenter, Geohydrology and Groundwater Flow at Verona Well Field, Battle Creek, Michigan. U.S. GS Water Resources Investigations Report 85-4056.

Hazardous Materials Technical Center (Dynamac Corporation) "Installation Restoration Program Phase I Records Search: 110th TASG, Michigan Air National Guard, W.K. Kellogg Regional Airport, Battle Creek, Michigan, June 1987.

HAZWRAP, 1990. Standard Operating Procedures for Site Characterizations, DOE/HWP-100, July 1990.

Hickok and Associates, Base Environmental Assessment. 110th Fighter Group, Michigan Air National Guard, 1985.

Radian Management Action Plan, 110th FG, MIANG, Battle Creek, Michigan, July 1994.

Snell Environmental Group, Base Master Plan, 110th FG MIANG, Battle Creek, Michigan, 29 July 1987.

State of Michigan, "Administrative Rules for Public Act 307, as amended"; 1982.

State of Michigan, MDNR; Thomas Weise Personal Communication, November 28, 1994.

State of Michigan, MDNR; MERA Operational Memorandum #15, September 30, 1993.

State of Michigan, MDNR; MERA Operational Memorandum #8, Revision 4, June 5, 1995.

State of Michigan, MDNR; Addendum to MERA Operational Memorandum #8, Revision 3, June 21, 1994.

State of Michigan, MDNR; Operational Memorandum #12, Revision 2, January 1995.

State of Michigan, MDNR, Operational Memorandum #14, Revision 2, June 6, 1995.

Vanlier, Kenneth E., 1966. Groundwater Resources of the Battle Creek Area, Michigan. Michigan Geological Survey, Water Investigation 4.

APPENDIX A: FIELD ANALYTICAL RESULTS

Table 2
Summary of Samples with Detectable Concentrations of Analytes
Michigan Air National Guard Base
110th Fighter Group
Battle Creek, Michigan

Sample ID	Trace #	Compound Detected	Concentration (µg/L)
BC-B-SG1A	103	TCE/Cis-1,2-DCE	5.2J
BC-B-SG1B	106	Toluene	45.83
BC-D-SG1A	109	TCE/Cis-1,2-DCE	2.67J
BC-D-SG1B	110	TCE/Cis-1,2-DCE	15.75
BC-D-SG1C	111	TCE/Cis-1,2-DCE	7.49
BC-E-SG1A	131	TCE/Cis-1,2-DCE	6.79
BC-FB-1	136	TCE/Cis-1,2-DCE	17.64
BC-B-SG2	139	TCE/Cis-1,2-DCE	1.08J
BC-B-SG3	140	TCE/Cis-1,2-DCE	8.41
BC-B-SG7	157	TCE/Cis-1,2-DCE	3.8J
BC-B-SG7	157	Toluene	33.14R
BC-B-SG7	157	TVOC	36.94JR
BC-B-SG10	160	TCE/Cis-1,2-DCE	0.43J
BC-B-SG11DUP	162	TCE/Cis-1,2-DCE	2.05J
BC-B-SG13	167	TCE/Cis-1,2-DCE	5.84
BC-B-SG13	167	Toluene	1.79J
BC-B-SG13	167	TVOC	7.63J
BC-B-SG14	168	TCE/Cis-1,2-DCE	35.4
BC-B-SG15	179	TCE/Cis-1,2-DCE	2.38J
BC-D-SG6	221	TCE/Cis-1,2-DCE	17.79
BC-D-SG6	221	~~TCE/Cis-1,2-DCE~~	31.56

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Table 2
Summary of Samples with Detectable Concentrations of Analytes

Sample ID	Trace #	Compound Detected	Concentration (µg/L)
BC-D-SG6	221	TVOC	49.35
BC-E-SG4	246	TCE/Cis-1,2-DCE	6.39
BC-E-SG13	268	TCE/Cis-1,2-DCE	16.56
BC-E-SG14	269	TCE/Cis-1,2-DCE	16.7
BC-E-SG17	273	TCE/Cis-1,2-DCE	1.38J
BC-E-SG18	274	TCE/Cis-1,2-DCE	37.28
BC-C-SG13	280	TCE/Cis-1,2-DCE	4.85

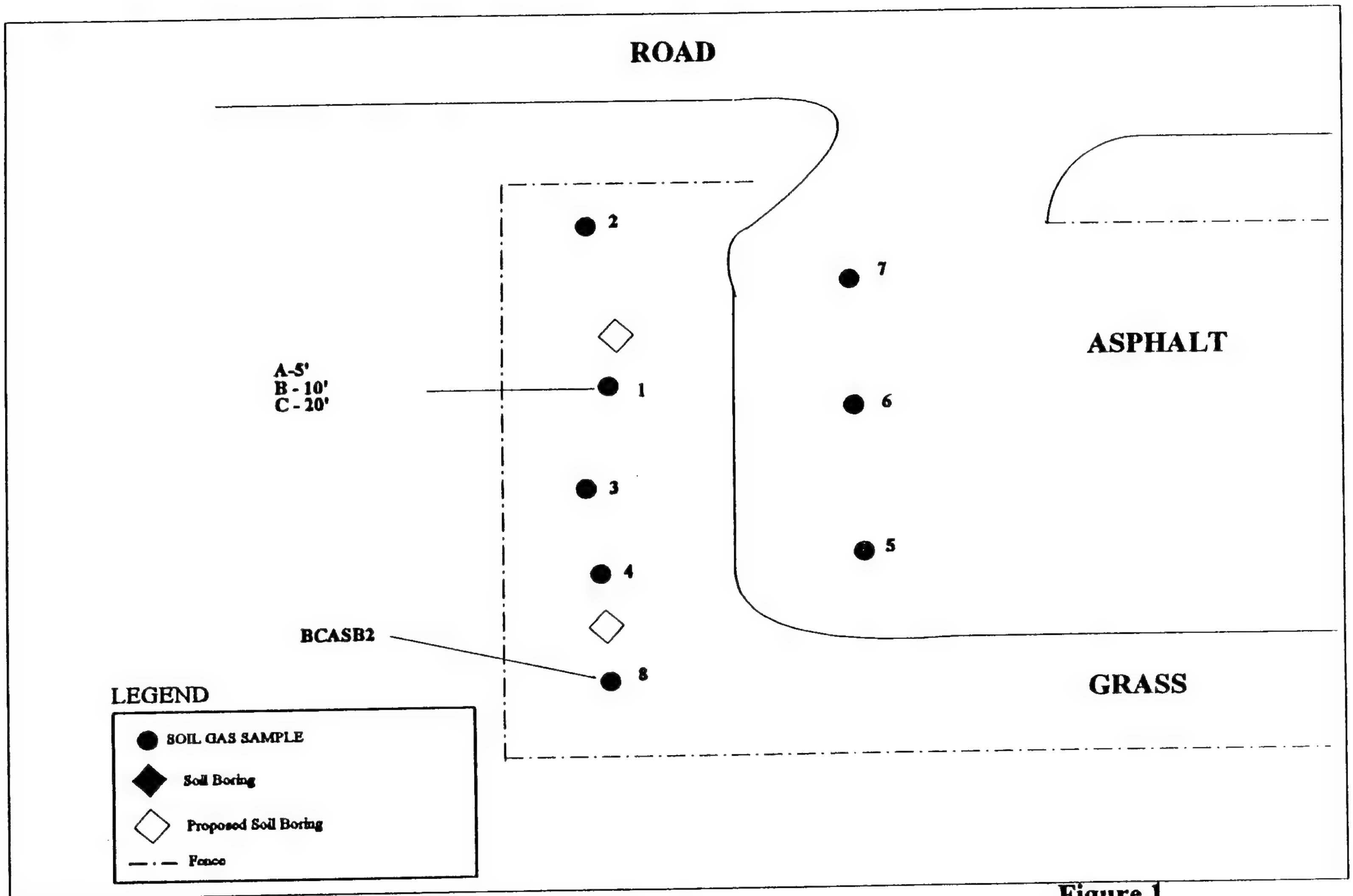


Figure 1

Area of Concern (AOC) A:
Former Fire Training Area - West
Air National Guard Base
Battle Creek, Michigan

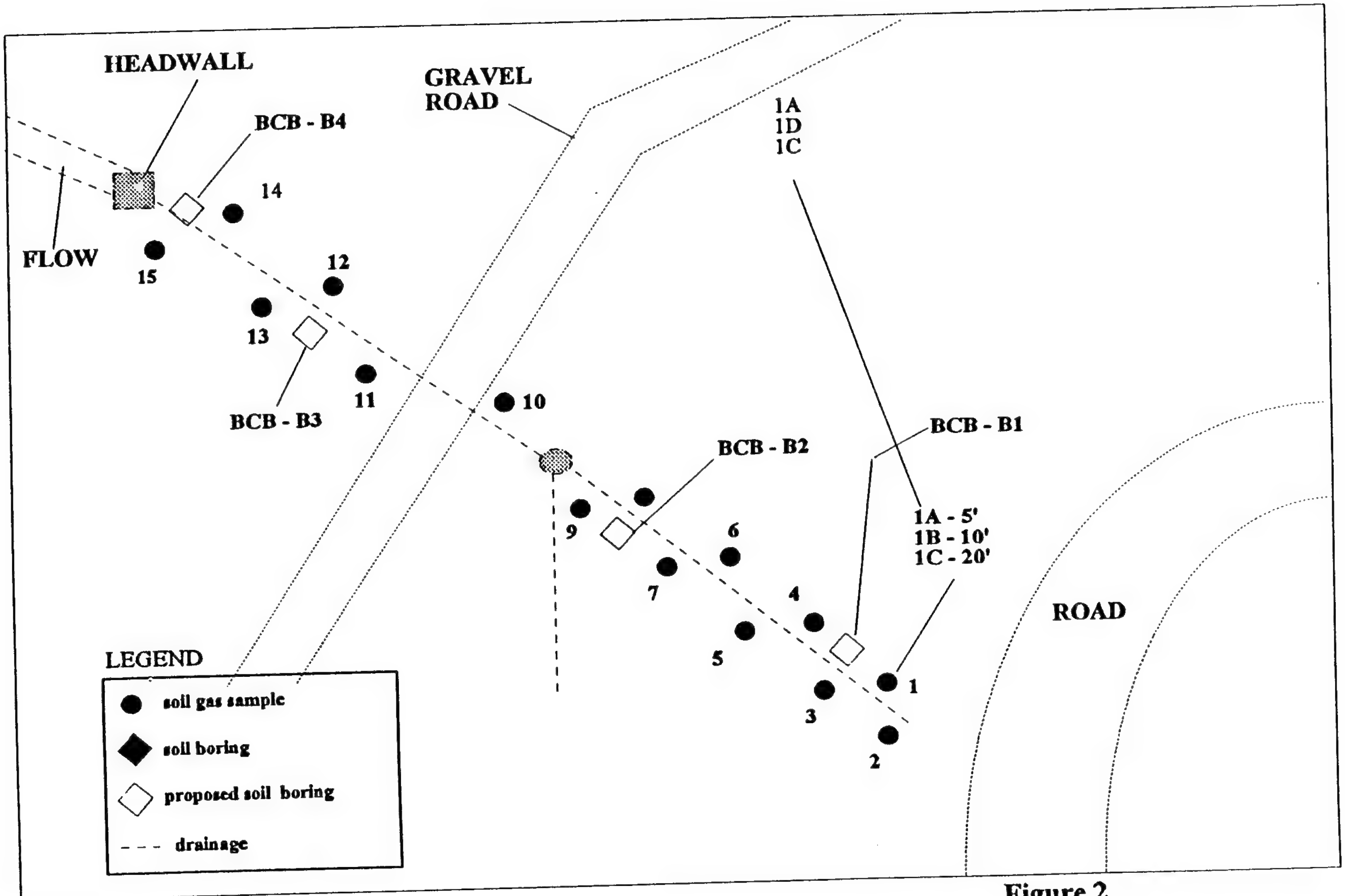


Figure 2
Area of Concern (AOC) B:
Motor Pool Parking
Air National Guard Base
Battle Creek, Michigan

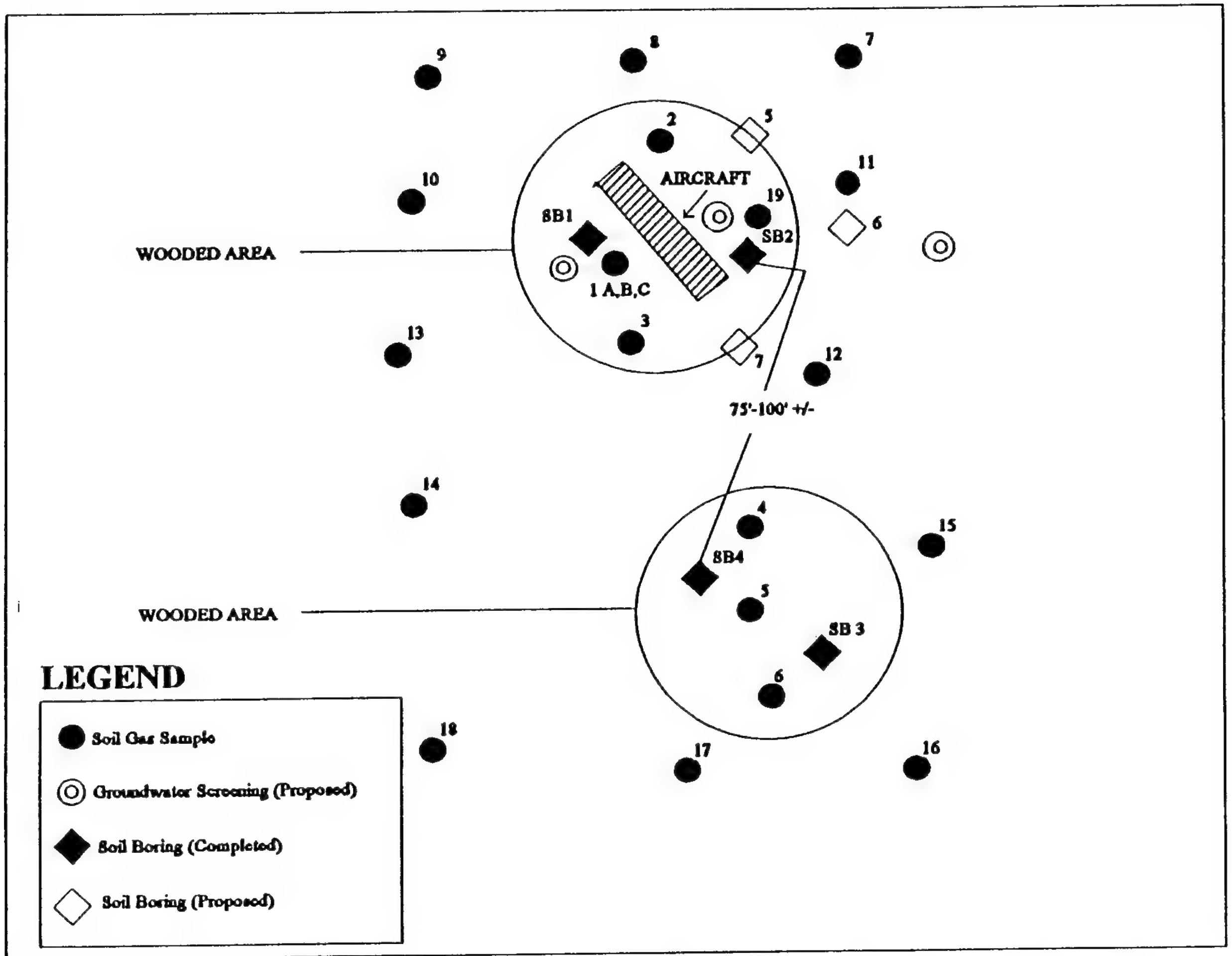


Figure 3

Area of Concern (AOC) C:
Fire Training Area - South
Air National Guard Base
Battle Creek, Michigan

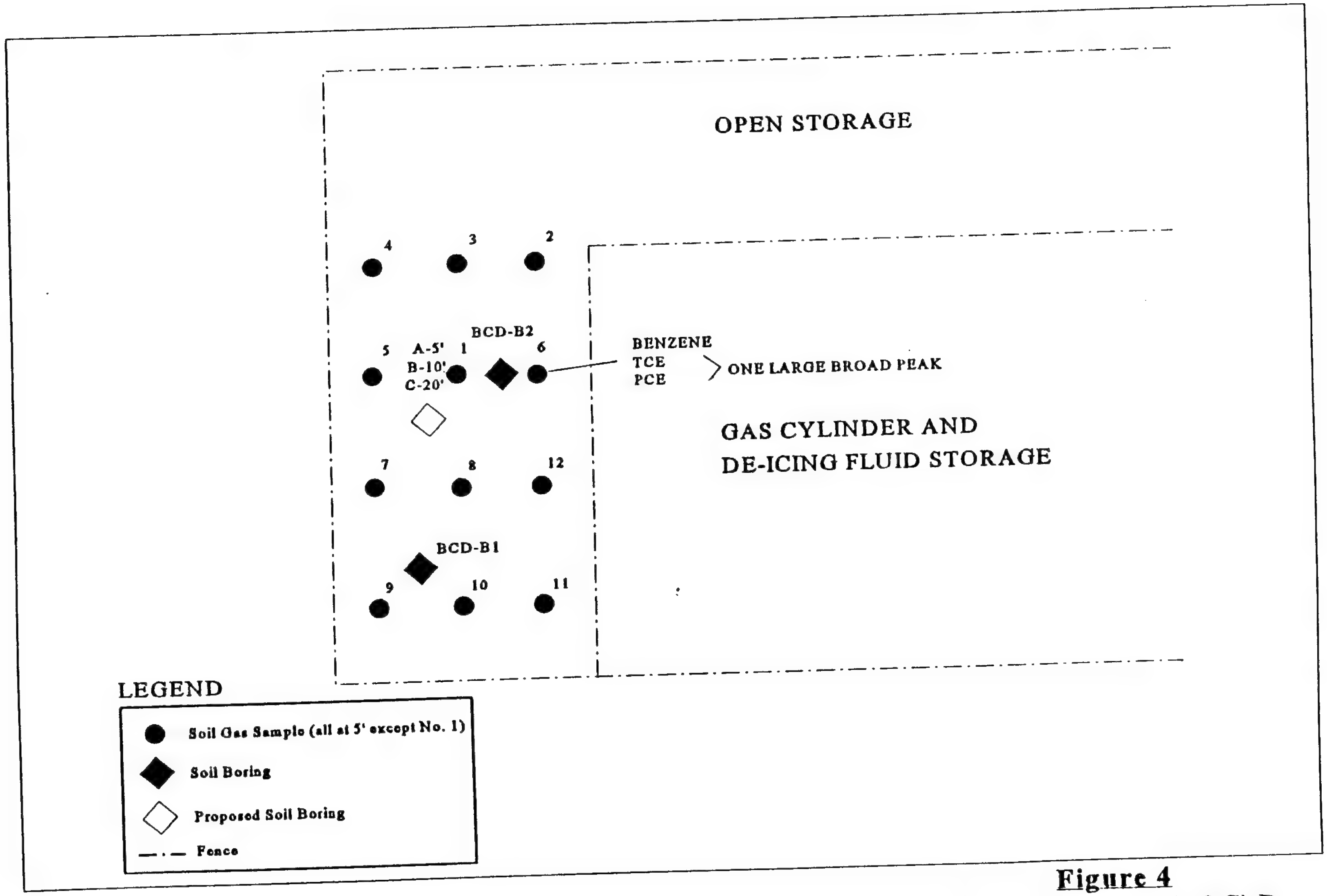


Figure 4
Area of Concern (AOC) D:
Former Fire Training Area - West
Air National Guard Base
Battle Creek, Michigan

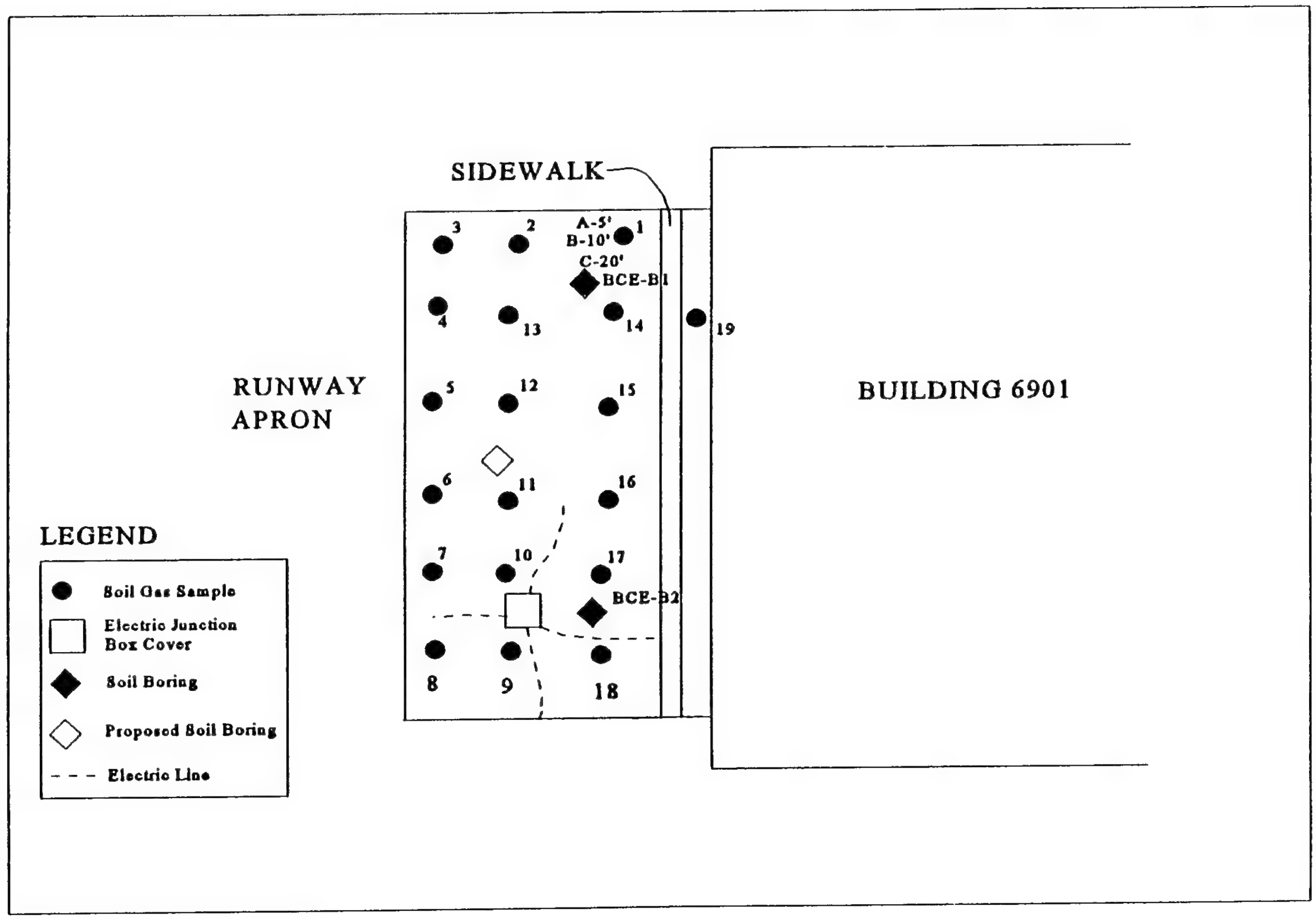


Figure 5

Area of Concern (AOC) E:
Old Hangar (Building 6901)
Air National Guard Base
Battle Creek, Michigan

Cis-1,2-DCE
The average %RSD during the second half of the SI (July 11-July 16, 1994) for cis-1,2-DCE was 25.35%. The range was 9.59 to 64.22%. Inconsistencies in sample temperature and variations in the ambient temperature inside the van contributed to the wide ranges in %RSD values.

TCE/cis-1,2-DCE
TCE and cis-1,2-DCE co-eluted and the standards are reported as a combined RF during the first half of the investigation (June 21- July 1, 1994). The average %RSD during the SI for TCE/cis-1,2-DCE was 25.65%. The range was 0.3 to 180.39%. Inconsistencies in sample temperature and variations in the ambient temperature inside the van contributed to the wide ranges in %RSD values.

TCE
The average %RSD during the second half of the SI (July 11 to July 16, 1994) for TCE was 15.26. The range was 1.91 to 44.48%. Inconsistencies in sample temperature and variations in the ambient temperature inside the van contributed to the wide ranges in %RSD values. Generally, TCE was used as the criteria for re-running check standards. If the %RSD for TCE was greater than 25, the standard was mixed again and re-run.

PCE
The average %RSD during the SI for PCE was 23.82%. The range was 0.98 to 78.61%. Inconsistencies in sample temperature and variations in the ambient temperature inside the van contributed to the wide ranges in %RSD values.

Toluene
The average %RSD during the SI for Toluene was 21.18%. The range was 0.92 to 71.02%. Inconsistencies in sample temperature and variations in the ambient temperature inside the van contributed to the wide ranges in %RSD values.

Ethylbenzene
Ethylbenzene co-eluted with chlorobenzene in field standards and samples were reported as chloro/ethylbenzene. The average %RSD during the SI was 45.19%. The range was 1.35 to 85.75%. Inconsistencies in sample temperature and variations in the ambient temperature inside the van contributed to the wide ranges in %RSD values.

m,p-xylene
The average %RSD during the SI for m,p-xylene was 42.45%. The range was 0.42 to 94.86%. The late elution of the xylenes in the packed column (less sensitive to the late-eluting compounds), in addition to inconsistencies in sample temperature and variations in the ambient temperature inside the van contributed to the wide ranges in %RSD values.

o-xylene
The average %RSD during the SI for o-xylene was 47.36%. The range was 1.87 to 87.31%. The late elution of the xylenes in the packed column (less sensitive to the late-eluting compounds), in addition to inconsistencies in sample temperature and variations in the ambient temperature inside the van, contributed to the wide ranges in %RSD values.

2.3.2 Samples

Duplicate samples (DUPS) were taken as quality assurance samples for soil gas and soil samples. DUPS were taken from the same bore hole and same interval for both media. The DUPS showed the same results as associated samples with the exception of one. BCB-SG11DUP had an estimated level of Toluene (2.05μg/L) and the associated sample was below the MDL for Toluene.

APPENDIX B

STANDARD CURVES, RESPONSE FACTORS AND QA

JOB# 1984-001

Trans 1,2 DCE

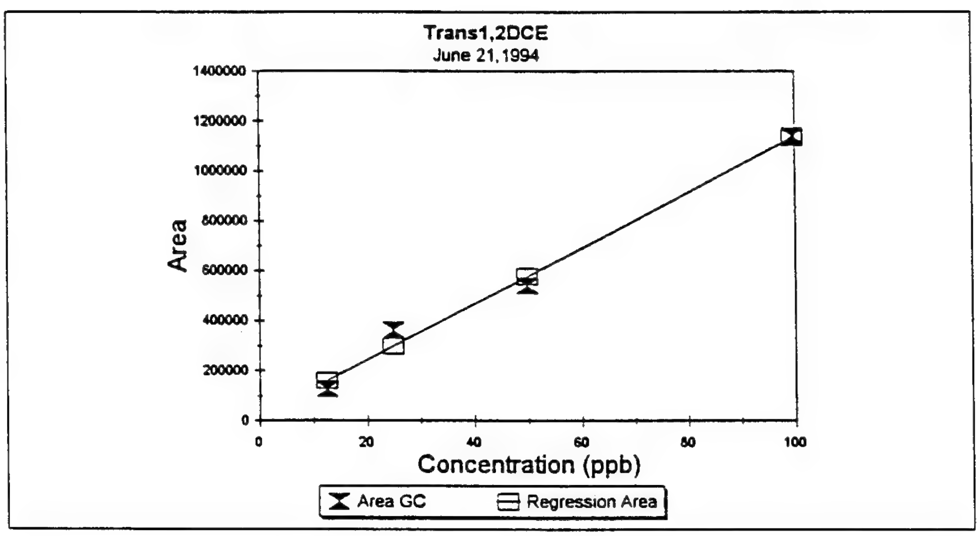
June 21, 1994

Calibration standards were used tocalibrate samples analyzed June 21, 1994 Traces 103-111

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
Trans 1,2 DCE	99.52	1140970.00	11464.44	11797.13
Trans 1,2 DCE	49.76	541363.00	10879.21	
Trans 1,2 DCE	24.88	362056.00	14551.72	
Trans 1,2 DCE	12.44	128050.00	10293.15	
Trans 1,2 DCE	0.00	0.00	0.00	
trans				

Regression Output:

Constant		21536.57
Std Err of Y Est		56245.92
R Squared		0.99
No. of Observations		4.00
Degrees of Freedom		2.00
X Coefficient(s)	11180.28045	
Std Err of Coef.	843.21990	



TCE/CIS

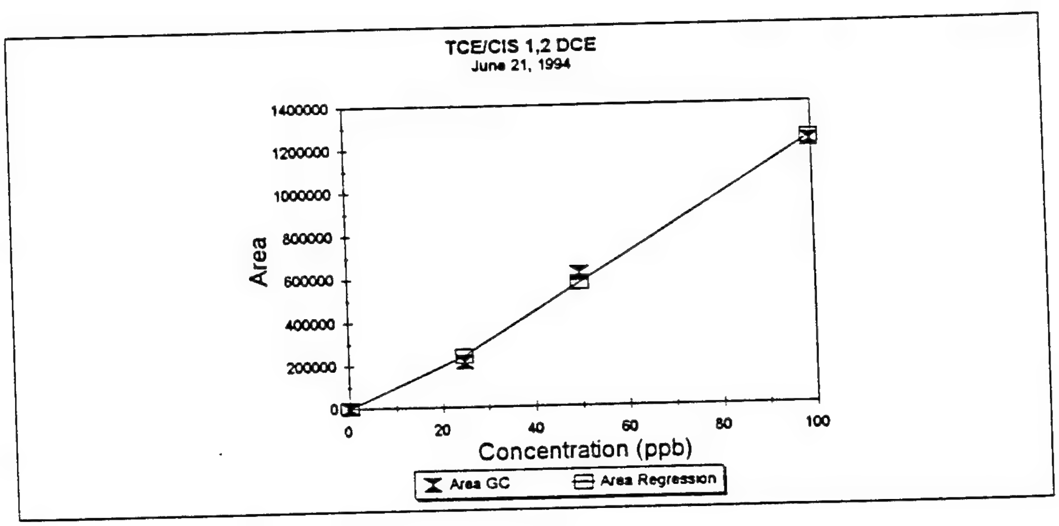
June 21, 1994

Calibration standards were used tocalibrate samples analyzed June 21, 1994 Traces 10

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				11071.58
TCE/CIS	99.52	1221734.00	12275.96	
TCE/CIS	49.76	616456.00	12388.27	
TCE/CIS	24.88	212742.00	8550.51	
TCE/CIS	0.00	0.00	0.00	

Regression Output:

Constant		-89897.00
Std Err of Y Est		54026.86
R Squared		0.99
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	13324.33	
Std Err of Coef.	1005.18	



PCE

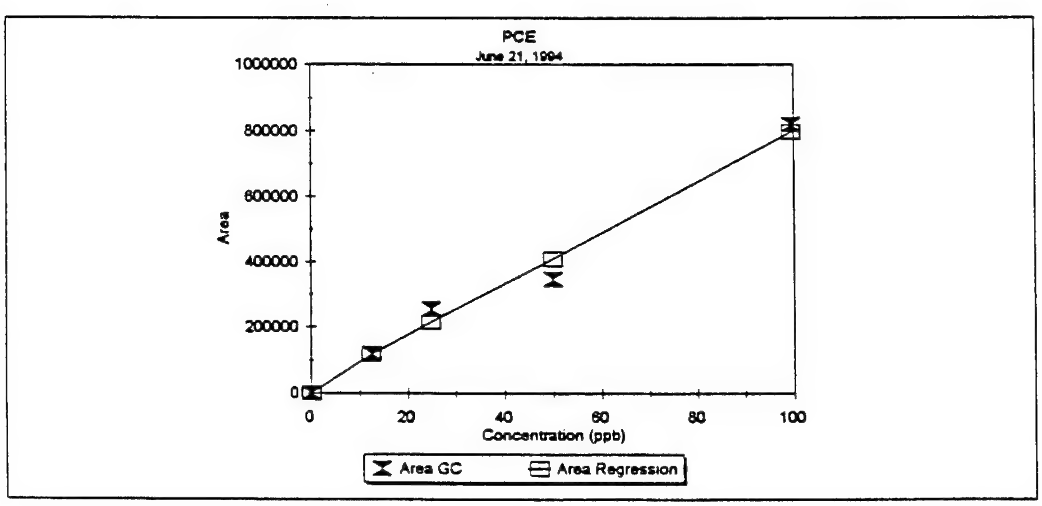
June 21, 1994

Calibration standards were used tocalibrate samples analyzed June 21, 1994 Traces 103-111

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
PCE	99.52	820615.00	8245.52	8794.98
PCE	49.76	346029.00	6953.78	
PCE	24.88	254762.00	10239.37	
PCE	12.44	121184.00	9741.23	
PCE	0.00	0.00	0.00	

Regression Output:

Constant		21078.17
Std Err of Y Est		55270.13
R Squared		0.98
No. of Observations		4.00
Degrees of Freedom		2.00
X Coefficient(s)	7814.79	
Std Err of Coef.	828.59	



Toluene

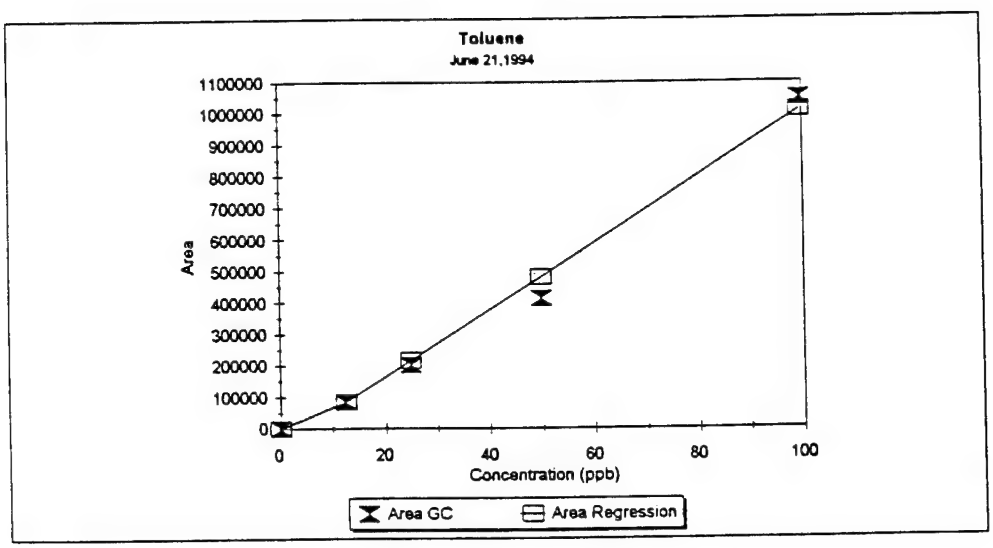
June 21, 1994

Calibration standards were used tocalibrate samples analyzed June 21, 1994 Traces 103-111

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
Toluene	99.52	1047632.00	10526.58	8418.54
Toluene	49.76	413224.00	8304.13	
Toluene	24.88	201970.00	8117.56	
Toluene	12.44	83672.00	6725.88	
Toluene	0.00	0.00	0.00	

Regression Output:

Constant		-46855.65
Std Err of Y Est		53298.30
R Squared		0.99
No. of Observations		5.00
Degrees of Freedom		3.00
X Coefficient(s)	10614.83	
Std Err of Coef.	677.41	



chloro/ethylbenzene

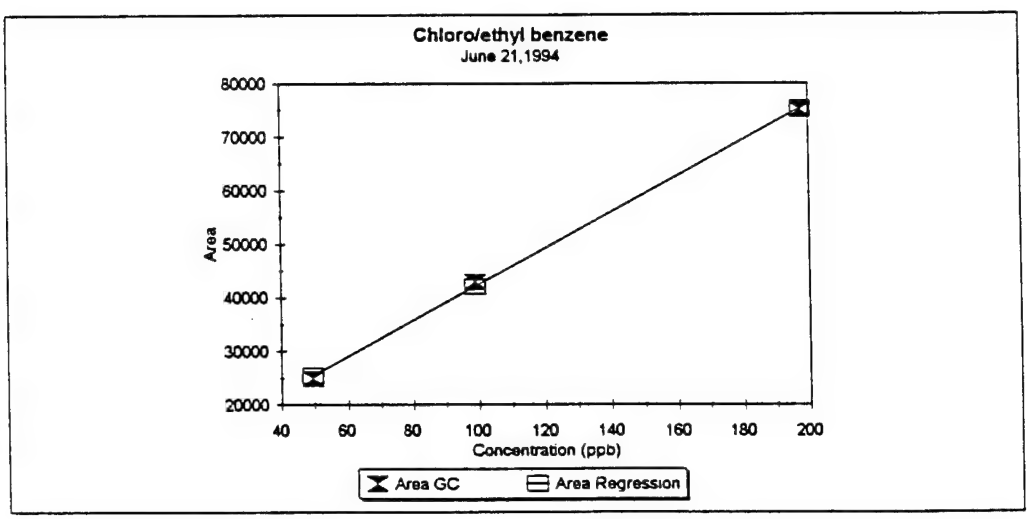
June 21, 1994

Calibration standards were used tocalibrate samples analyzed June 21, 1994 Traces 103-111

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
chloro/ethylbenzene	197.55	75021.00	379.77	440.01
chloro/ethylbenzene	98.77	42984.00	435.18	
chloro/ethylbenzene	49.39	24944.00	505.08	

Regression Output:

Constant		8925.50
Std Err of Y Est		1080.54
R Squared		1.00
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	336.05	
Std Err of Coef.	10.13	



p-xylene

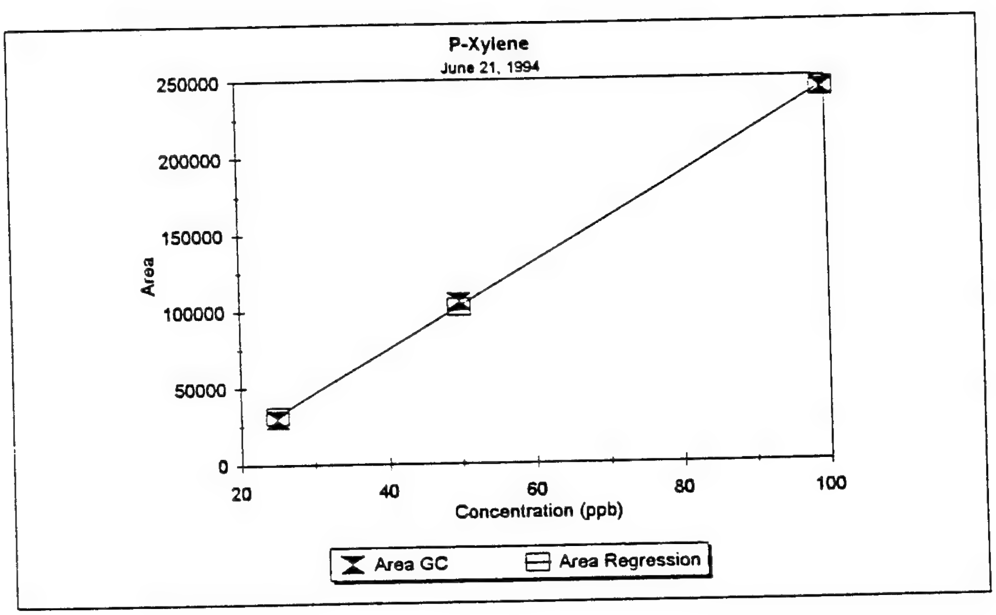
June 21, 1994

Calibration standards were used tocalibrate samples analyzed June 21, 1994 Traces 103-111

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
p-xylene	99.52	242240.00	2434.02	1919.22
p-xylene	49.76	105720.00	2124.54	
p-xylene	24.88	29834.00	1199.09	

Regression Output:

Constant		-38426.00
Std Err of Y Est		4076.27
R Squared		1.00
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	2831.07	
Std Err of Coef.	75.84	



o-xylene

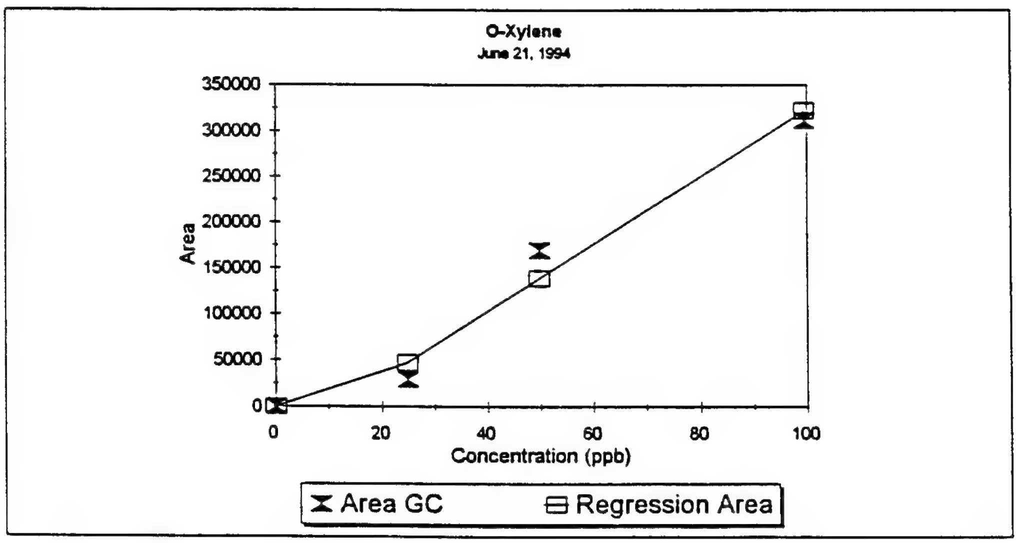
June 21, 1994

Calibration standards were used tocalibrate samples analyzed June 21, 1994 Traces 103-111

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
o-xylene	99.52	312036.00	3135.33	2568.25
o-xylene	49.76	169380.00	3403.85	
o-xylene	24.88	29000.00	1165.57	
o-xylene	0.00	0.00	0.00	

Regression Output:

Constant		-44276.17
Std Err of Y Est		26146.94
R Squared		0.98
No. of Observations		4.00
Degrees of Freedom		2.00
X Coefficient(s)	3684.37	
Std Err of Coef.	391.99	



Trans 1,2 DCE

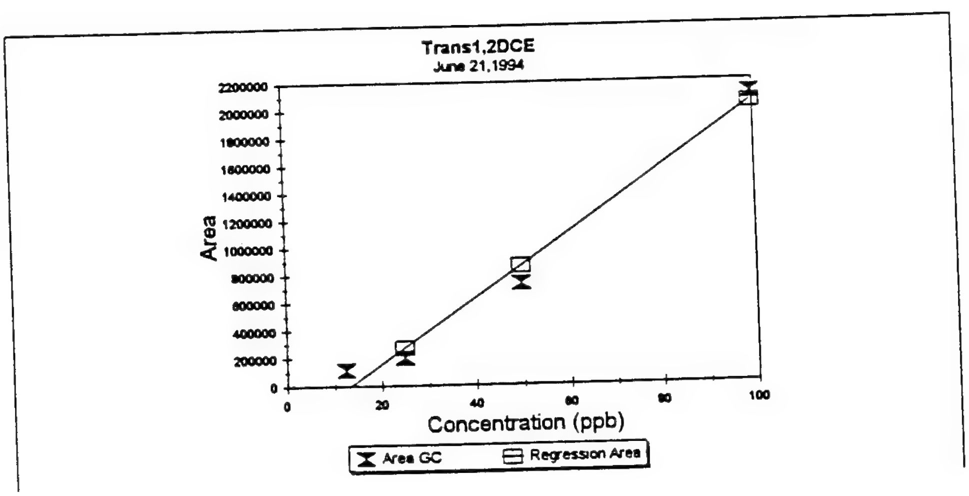
June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
Trans 1,2 DCE	99.52	2100623.00	21107.02	13282.19
Trans 1,2 DCE	49.76	732702.00	14724.35	
Trans 1,2 DCE	24.88	202390.00	8134.44	
Trans 1,2 DCE	12.44	113990.00	9162.95	
Trans 1,2 DCE	0.00	0.00	0.00	

Regression Output:

Constant	-313856.57
Std Err of Y Est	147839.92
R Squared	0.98
No. of Observations	4.00
Degrees of Freedom	2.00
X Coefficient(s)	23606.75565
Std Err of Coef.	2216.36614



Trans 1,2 DCE

June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Date & time	Trans Trace#	area	Conc	%RSD
6/21/94 20:24	123	608308.00	49.76	7.96
6/22/94 09:58	130	1360164.00	49.76	105.79
6/22/94 11:19	134	311841.00	49.76	52.82
6/22/94 14:49	142	372071.00	49.76	43.71
6/22/94 17:39	146	337677.00	49.76	48.91

TCE/CIS

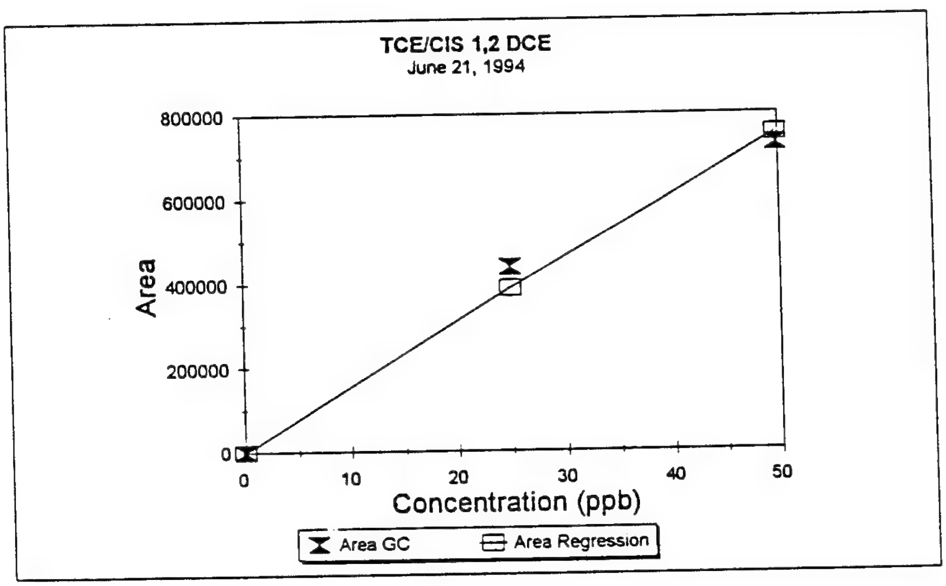
June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				16128.50
TCE/CIS	49.76	728369.00	14637.27	
TCE/CIS	24.88	438390.00	17619.73	
TCE/CIS	0.00	0.00	0.00	

Regression Output:

Constant		24735.17
Std Err of Y Est		60588.54
R Squared		0.99
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	14637.27	
Std Err of Coef.	1721.92	



TCE/CIS

June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Date & time	TCE/CIS Trace#	area	Conc	%RSD
6/21/94 20:24	123	65526.00	99.52	95.92
6/22/94 09:58	130		99.52	100.00
6/22/94 11:19	134	380564.00	99.52	76.29
6/22/94 14:49	142		99.52	100.00
6/22/94 17:39	146		99.52	100.00

PCE

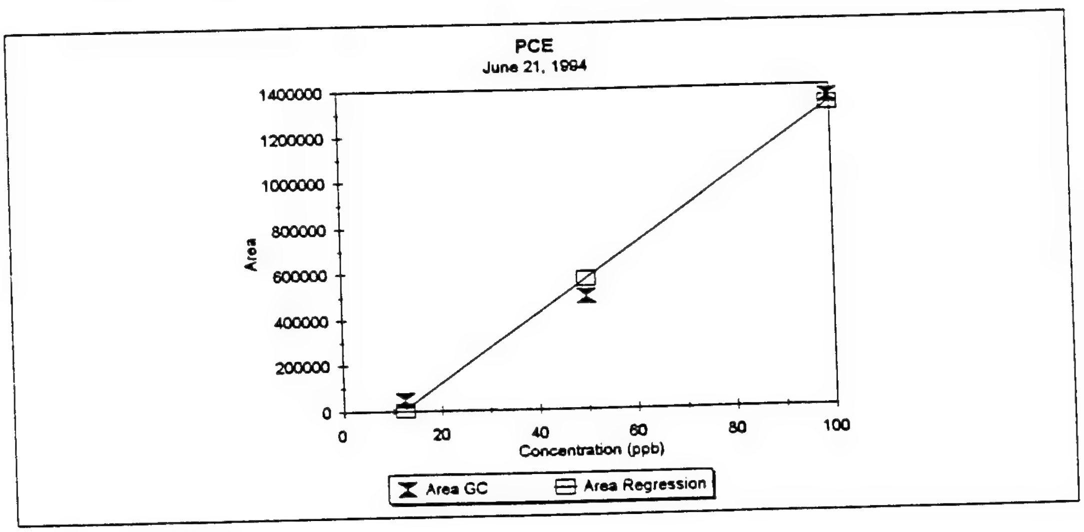
June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Analyte	Conc (μg/L)	Area Area counts	RF Area counts/(μg/L)	AVG RF Area counts/(μg/L)
PCE	99.52	1353328.00	13598.21	9083.63
PCE	49.76	494234.00	9932.11	
PCE	12.44	46285.00	3720.57	
PCE	0.00	0.00	0.00	

Regression Output:

Constant		-184410.51
Std Err of Y Est		91310.89
R Squared		0.99
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	15131.20	
Std Err of Coef.	1477.87	



PCE

June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Date & time	PCE Trace#	area	Conc	%RSD
6/21/94 20:24	123	346858.00	49.76	23.26
6/22/94 09:58	130	886393.00	49.76	96.10
6/22/94 11:19	134	252831.00	49.76	44.07
6/22/94 14:49	142	111023.00	49.76	75.44
6/22/94 17:39	146	110470.00	49.76	75.56

Toluene

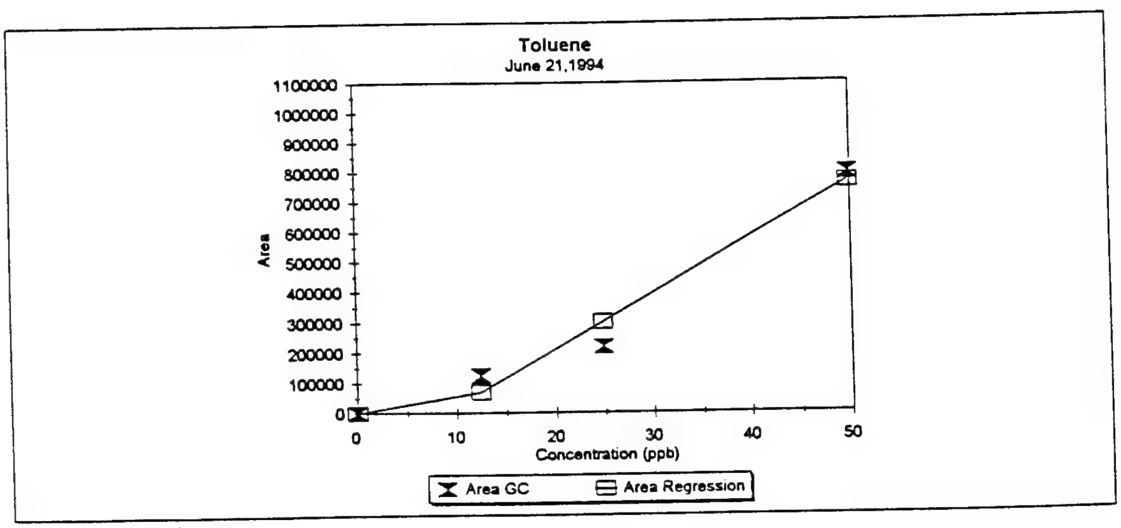
June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
Toluene	99.52	2331529.00	23427.15	11570.55
Toluene	49.76	793353.00	15943.19	
Toluene	24.88	218511.00	8782.38	
Toluene	12.44	124230.00	9986.08	
Toluene	0.00	0.00	0.00	

Regression Output:

Constant		-163191.00
Std Err of Y Est		103237.67
R Squared		0.96
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	18668.19	
Std Err of Coef.	3841.52	



Toluene

Toluene

June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Date & time	Trace#	area	Conc	%RSD
6/21/94 20:24	123	648916.00	49.76	12.71
6/22/94 09:58	130	2121535.00	49.76	268.47
6/22/94 11:19	134	667997.00	49.76	16.02
6/22/94 14:49	142	443143.00	49.76	23.03
6/22/94 17:39	146	454178.00	49.76	21.12

chloro/ethylbenzene

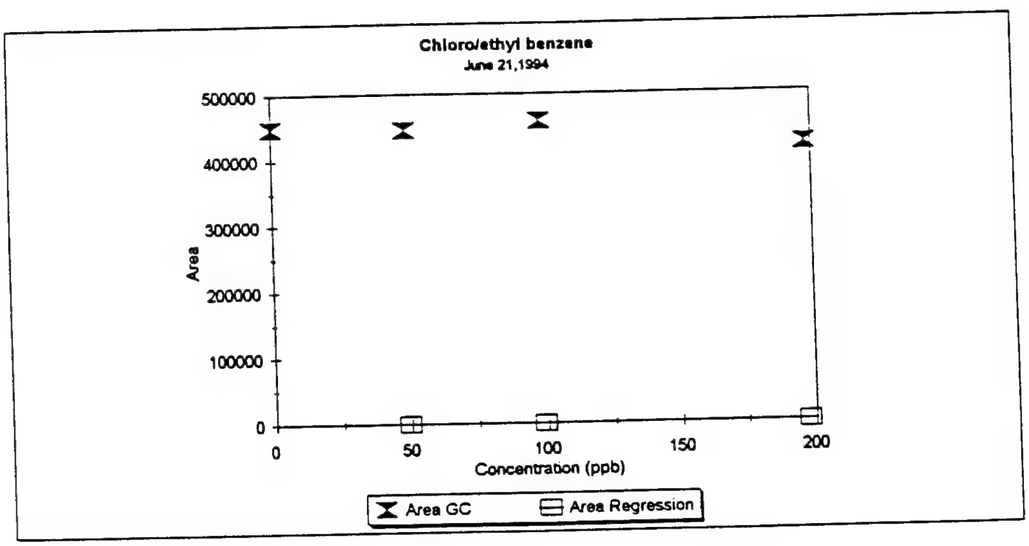
June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts
chloro/ethylbenzene	197.55	422386.00	2138.17	5277.04
chloro/ethylbenzene	98.77	459537.00	4652.47	
chloro/ethylbenzene	49.39	446477.00	9040.49	
chloro/ethylbenzene	0.00	449295.00	ERR	

Regression Output:

Constant		465052.50
Std Err of Y Est		16909.89
R Squared		0.60
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	-193.11	
Std Err of Coef.	158.50	



chloro/ethylbenzene

June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Date & time	Trace#	area	Conc	%RSD
6/21/94 20:24	123	441973.00	99.52	
6/22/94 09:58	130	245019.00	99.52	
6/22/94 11:19	134		99.52	
6/22/94 14:49	142	274535.00	99.52	
6/22/94 17:39	146	310133.00	99.52	

p-xylene

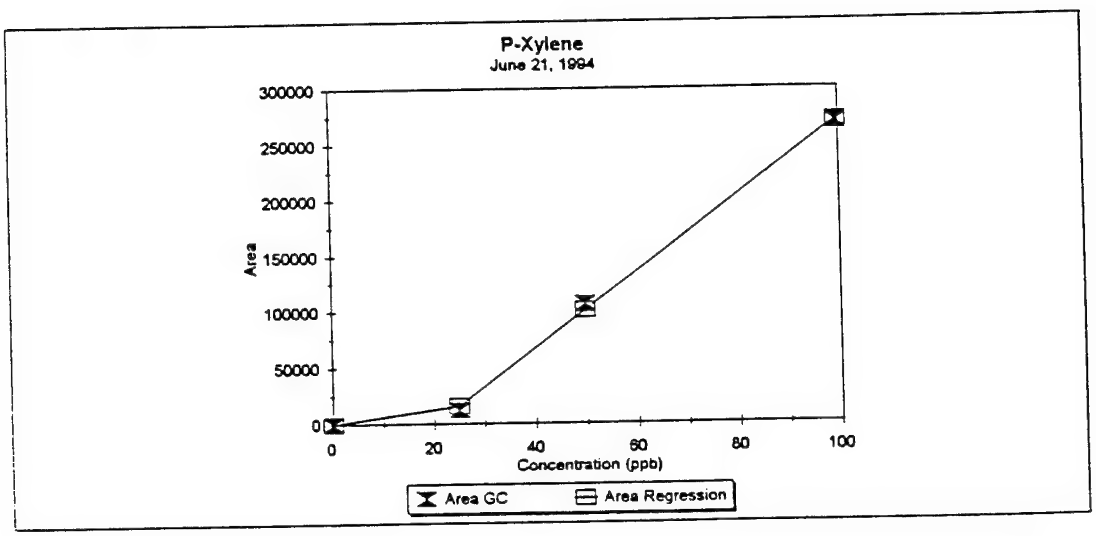
June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts
p-xylene	99.52	269094.00	2703.85	1781.93
p-xylene	49.76	106642.00	2143.07	
p-xylene	24.88	12412.00	498.86	
p-xylene	0.00	0.00	0.00	

Regression Output:

Constant		-68814.00
Std Err of Y Est		6950.93
R Squared		1.00
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	3413.96	
Std Err of Coef.	129.32	



p-xylene

June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Date & time	p-xylene Trace#	area	Conc	%RSD
6/21/94 20:24	123	165613.00	49.76	86.77
6/22/94 09:58	130	306970.00	49.76	246.19
6/22/94 11:19	134	219293.00	49.76	147.31
6/22/94 14:49	142	117814.00	49.76	32.87
6/22/94 17:39	146	123590.00	49.76	39.38

o-xylene

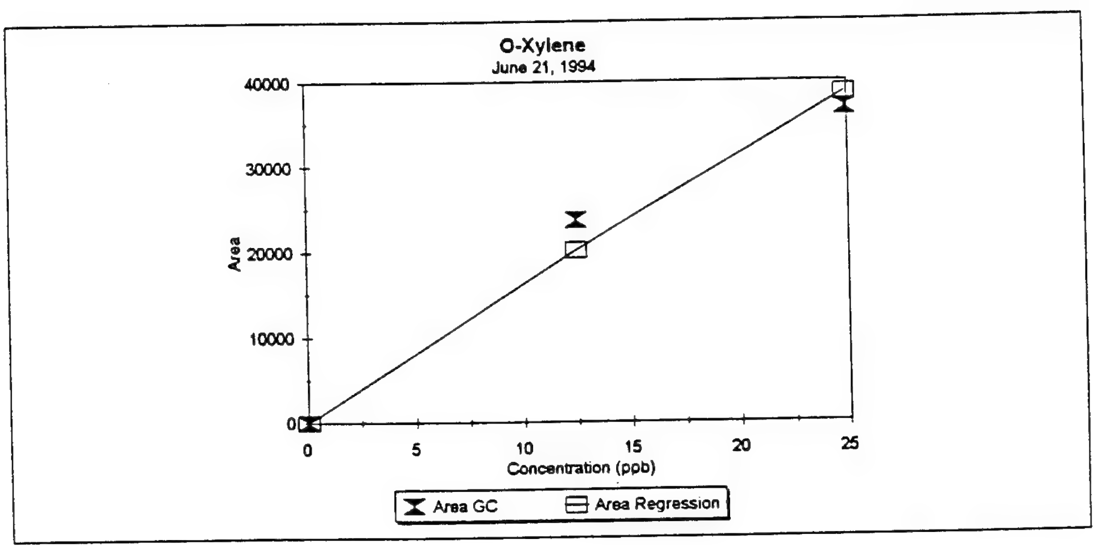
June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				1692.70
o-xylene	24.88	36841.00	1480.71	
o-xylene	12.44	23695.00	1904.69	
o-xylene	0.00	0.00	0.00	

Regression Output:

Constant		1758.17
Std Err of Y Est		4306.61
R Squared		0.97
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	1480.71	
Std Err of Coef.	244.79	



o-xylene

June 21, 1994

Calibration standards were used to calibrate samples analyzed June 21, 1994 Traces 119-146

Date & time	o-xylene Trace#	area	Conc	%RSD
6/21/94 20:24	123	165534.00	49.76	96.52
6/22/94 09:58	130	337837.00	49.76	301.08
6/22/94 11:19	134	428912.00	49.76	409.21
6/22/94 14:49	142	95224.00	49.76	13.05
6/22/94 17:39	146	104818.00	49.76	24.44

Trans 1,2 DCE

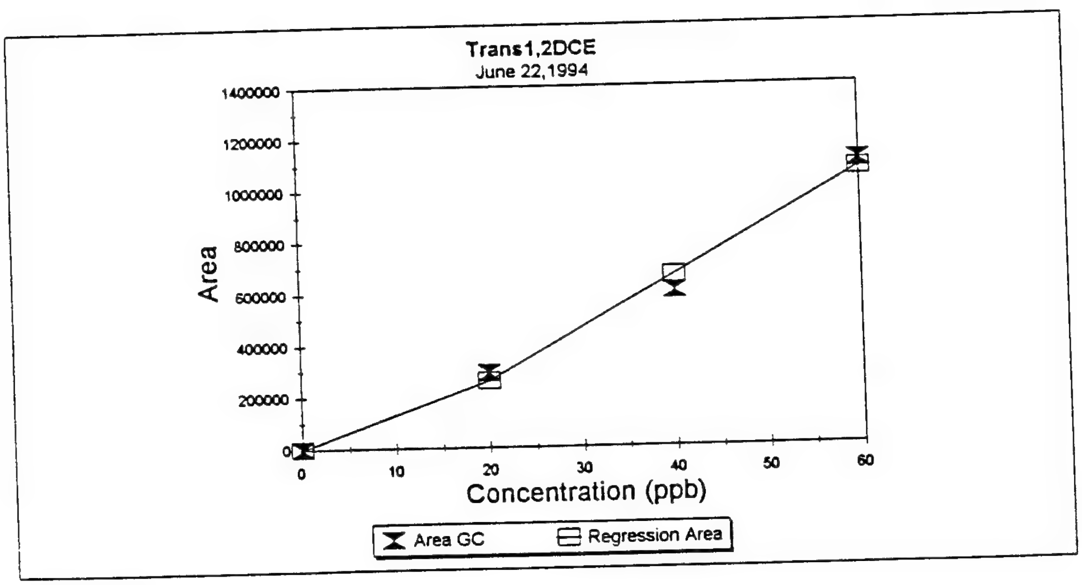
June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Analyte	Conc (μg/L)	Area Area counts	RF Area counts/(μg/L	AVG RF Area counts/(μg/L)
				15987.97
Trans 1,2 DCE	60.00	1100839.00	18347.32	
Trans 1,2 DCE	40.00	602092.00	15052.30	
Trans 1,2 DCE	20.00	291286.00	14564.30	
Trans 1,2 DCE	0.00	0.00	0.00	

Regression Output:

Constant		-144814.00
Std Err of Y Est		76726.59
R Squared		0.98
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	20238.82500	
Std Err of Coef.	2712.69467	



Trans 1,2 DCE

June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Date & time	trans Trace#	area	Conc	%RSD
6/23/94 08:02	156	168855.00	80.00	86.80
6/23/94 10:02	161	475065.00	40.00	25.72
6/23/94 13:09	166	573452.00	40.00	10.33
6/23/94 15:21	178	427285.00	40.00	33.19

TCE

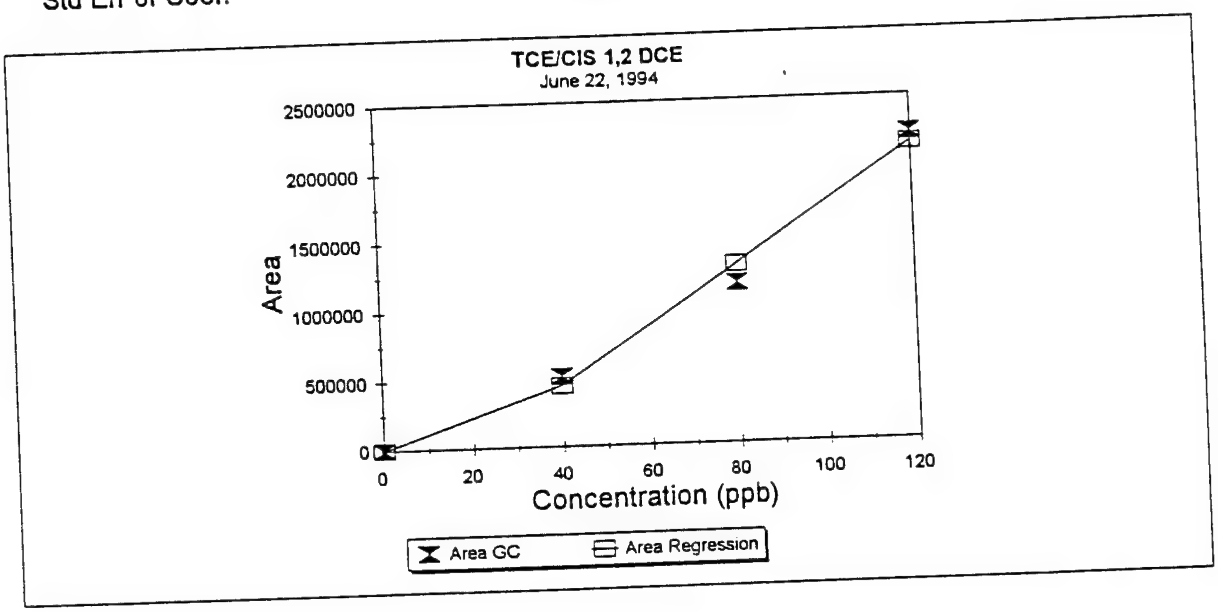
June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				15342.68
TCE	120.00	2226323.00	18552.69	
TCE	80.00	1164886.00	14561.08	
TCE	40.00	516571.00	12914.28	
TCE	0.00	0.00	0.00	

Regression Output:

Constant		-407158.67
Std Err of Y Est		168656.35
R Squared		0.98
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	21371.90	
Std Err of Coef.	2981.45	



1984-001

TCE

June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Date & time	tce/cis Trace#	area	Conc	%RSD
6/23/94 08:02	156	1015325.00	160.00	58.64
6/23/94 10:02	161	282517.00	80.00	76.98
6/23/94 13:09	166	1082778.00	80.00	11.78
6/23/94 15:21	178	636712.00	80.00	48.13

PCE

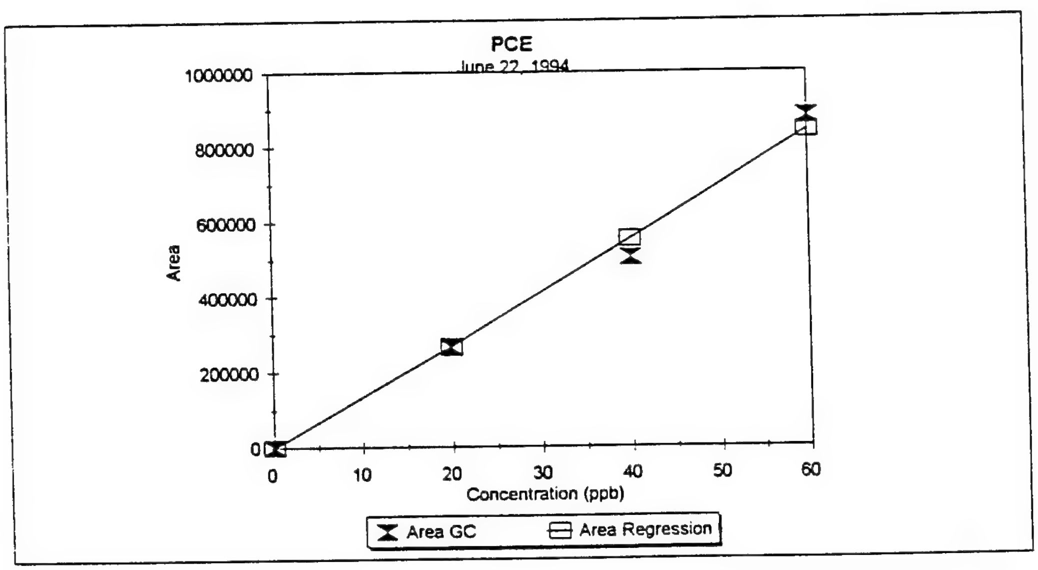
June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				13486.66
PCE	60.00	879276.00	14654.60	
PCE	40.00	504637.00	12615.93	
PCE	20.00	263789.00	13189.45	
PCE	0.00	0.00	0.00	

Regression Output:

Constant		-19875.90
Std Err of Y Est		46369.04
R Squared		0.99
No. of Observations		4.00
Degrees of Freedom		2.00
X Coefficient(s)	14393.38	
Std Err of Coef.	1036.84	



PCE

June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Date & time	Trace#	area	Conc	%RSD
6/23/94 08:02	156	216298.00	80.00	79.95
6/23/94 10:02	161	258116.00	40.00	52.15
6/23/94 13:09	166	440214.00	40.00	18.40
6/23/94 15:21	178	477811.00	40.00	11.43

Toluene

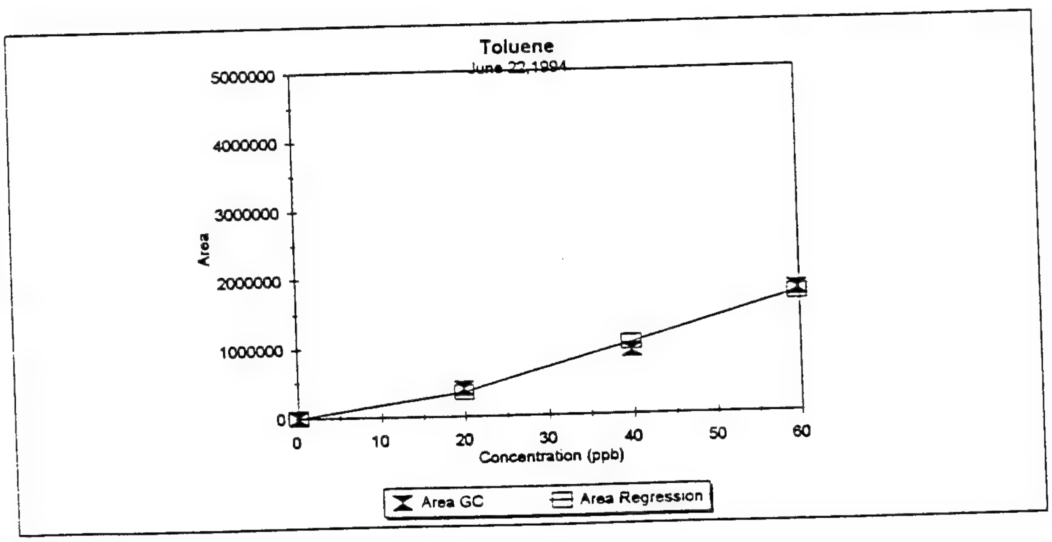
June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
Toluene	79.62	6144076.00	77169.43	24384.49
Toluene	59.71	1777132.00	29760.98	
Toluene	39.81	918922.00	23083.27	
Toluene	19.90	404245.00	20309.23	
Toluene	0.00	0.00	0.00	

Regression Output:

Constant		-339454.00
Std Err of Y Est		140246.76
R Squared		0.98
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	34486.85	
Std Err of Coef.	4982.26	



Toluene

June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Date & time	Trace#	area	Conc	%RSD
6/23/94 08:02	156	768275.00	79.62	60.43
6/23/94 10:02	161	812119.00	39.81	16.34
6/23/94 13:09	166	763247.00	39.81	21.37
6/23/94 15:21	178	771805.00	39.81	20.49

chloro/ethylbenzene

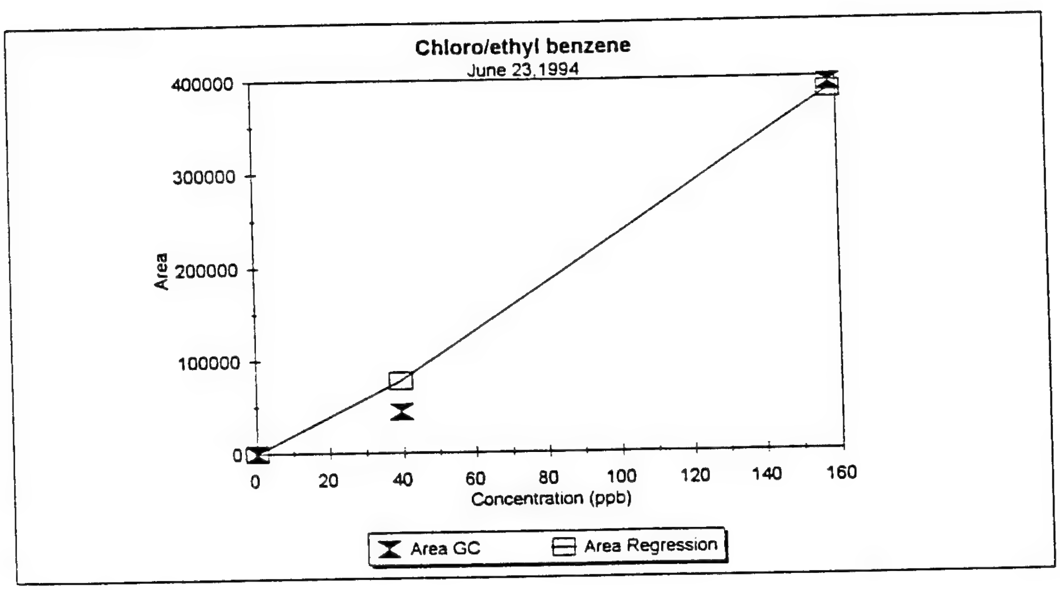
June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
chloro/ethylbenzene	158.04	394290.00	2494.93	1810.05
chloro/ethylbenzene	39.51	44454.00	1125.16	
chloro/ethylbenzene	0.00	0.00	0.00	

Regression Output:

Constant		-24977.77
Std Err of Y Est		42454.04
R Squared		0.98
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	2600.30	
Std Err of Coef.	365.00	



chloro/ethylbenzene

June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Date & time	Trace#	area	Conc	%RSD
6/23/94 08:02	156	297208.00	158.04	3.90
6/23/94 10:02	161	357506.00	79.02	149.96
6/23/94 13:09	166	323514.00	79.02	126.19
6/23/94 15:21	178	371482.00	79.02	159.73

p-xylene

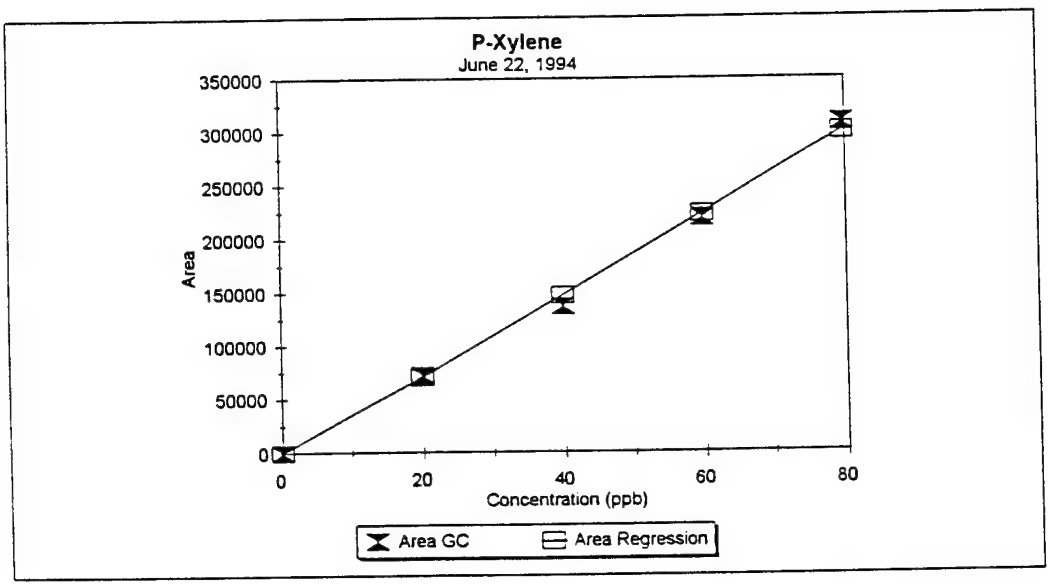
June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
p-xylene	79.62	308090.00	3869.60	3661.77
p-xylene	59.71	219893.00	3682.47	
p-xylene	39.81	137218.00	3446.91	
p-xylene	19.90	72614.00	3648.12	
p-xylene	0.00	0.00	0.00	

Regression Output:

Constant		-5128.80
Std Err of Y Est		8422.05
R Squared		1.00
No. of Observations		5.00
Degrees of Freedom		3.00
X Coefficient(s)	3835.61	
Std Err of Coef.	133.80	



p-xylene

June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Date & time	Trace#	area	Conc	%RSD
6/23/94 08:02	156	581195.00	79.62	99.35
6/23/94 10:02	161	103430.00	39.81	29.05
6/23/94 13:09	166	217774.00	39.81	49.39
6/23/94 15:21	178	122963.00	39.81	15.65

o-xylene

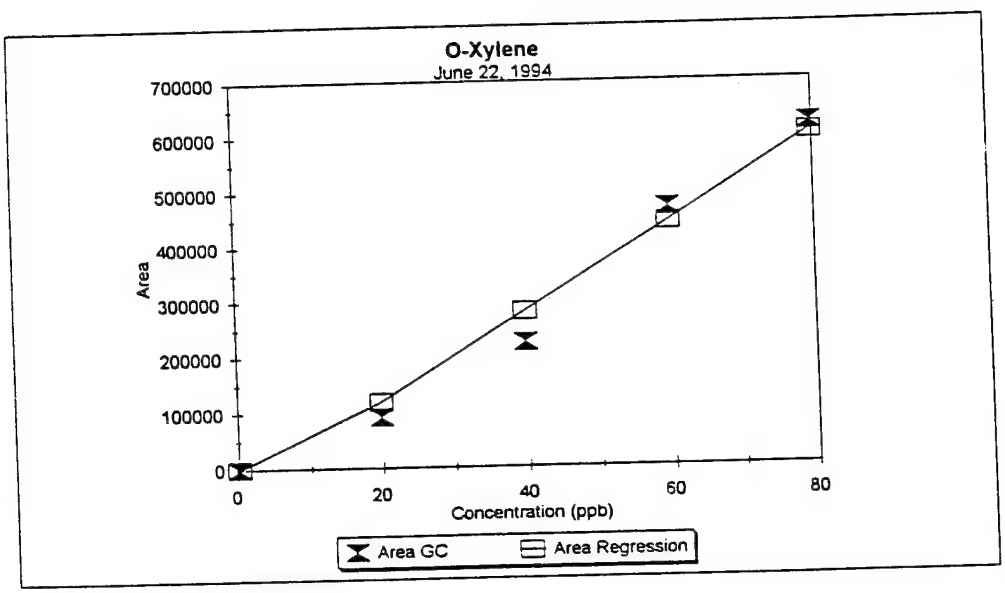
June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
o-xylene	79.62	619310.00	7778.52	6472.41
o-xylene	59.71	468295.00	7842.36	
o-xylene	39.81	224467.00	5638.60	
o-xylene	19.90	92161.00	4630.16	
o-xylene	0.00	0.00	0.00	

Regression Output:

Constant		-42104.20
Std Err of Y Est		46929.22
R Squared		0.98
No. of Observations		5.00
Degrees of Freedom		3.00
X Coefficient(s)	8112.51	
Std Err of Coef.	745.58	



o-xylene

June 22, 1994

Calibration standards were used tocalibrate samples analyzed June 22, 1994 Traces 157-179

Date & time	Trace#	area	Conc	%RSD
6/23/94 08:02	156	783228.00	79.62	51.99
6/23/94 10:02	161	159125.00	39.81	38.24
6/23/94 13:09	166	227637.00	39.81	11.65
6/23/94 15:21	178	104097.00	39.81	59.60

Trans 1,2 DCE

June 23, 1994

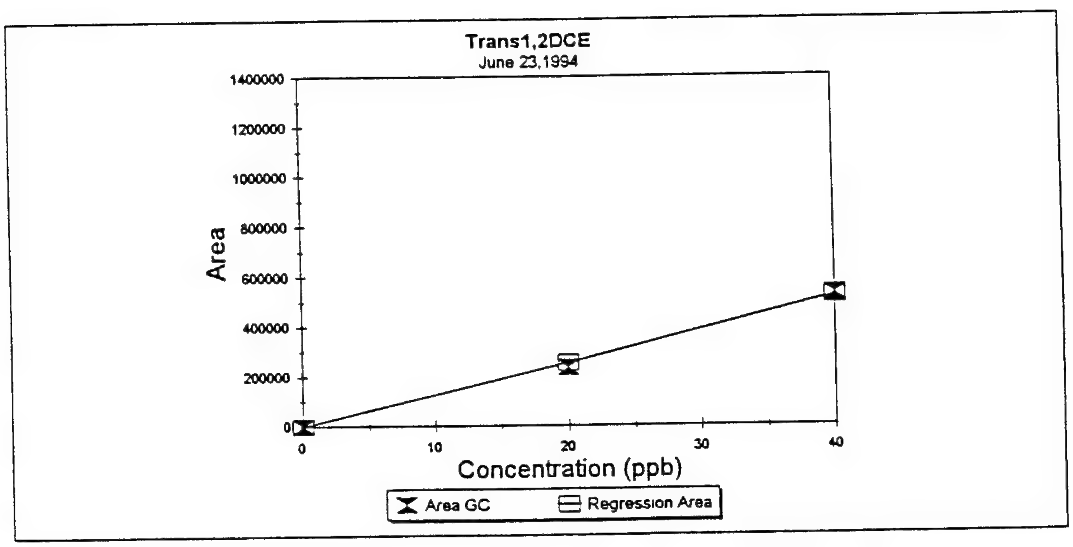
Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				12487.15
Trans 1,2 DCE	40.00	528002.00	13200.05	
Trans 1,2 DCE	20.00	235485.00	11774.25	
Trans 1,2 DCE	0.00	0.00	0.00	

Regression Output:

Constant	-9505.33
Std Err of Y Est	23283.22
R Squared	1.00
No. of Observations	3.00
Degrees of Freedom	1.00

X Coefficient(s)	13200.05000
Std Err of Coef.	823.18601



Trans 1,2 DCE

June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Date & time	trans Trace#	area	Conc	%RSD
6/24/94 08:07	188	499554.00	40.00	0.01
6/24/94 11:50	196	527145.00	40.00	5.54
6/24/94 15:42	202	620809.00	40.00	24.29
6/24/94 17:32	207	512675.00	40.00	2.64
6/25/94 08:49	210	419205.00	40.00	16.07
6/25/94 10:09	213	397632.00	40.00	20.39
6/25/94 12:15	219	456624.00	40.00	8.58
6/25/94 16:01	227	474814.00	40.00	4.94
6/25/94 17:19	231	491789.00	40.00	1.54
6/26/94 08:40	234	415128.00	40.00	16.89
6/26/94 10:49	240	1097617.00	80.00	9.87
6/26/94 12:07	243	332647.00	40.00	33.40
6/26/94 15:41	249	510976.00	40.00	2.30
6/27/94 10:01	255	499524.00	40.00	0.01
6/27/94 12:03	261	467031.00	40.00	6.50
6/27/94 15:14	270	328892.00	40.00	34.15
6/27/94 18:18	277	394630.00	40.00	20.99
6/28/94 08:09	279	285862.00	40.00	42.77
6/28/94 11:21	286	608704.00	40.00	21.87
6/28/94 14:08	292	515996.00	40.00	3.31
6/28/94 14:45	293	803909.00	40.00	60.95
6/28/94 16:18	297	326179.00	40.00	34.70
6/28/94 17:01	299	466064.00	40.00	6.69
6/29/94 08:49	302	575933.00	40.00	15.31
6/29/94 12:59	306	410379.00	40.00	17.84
6/29/94 15:27	312	788839.00	60.00	5.29
6/29/94 17:45	317	291923.00	40.00	41.56
6/30/94 08:05	319	452928.00	40.00	9.32
6/30/94 10:05	325	649207.00	40.00	29.98
6/30/94 13:08	332	726466.00	40.00	45.44
6/30/94 13:50	334	416994.00	40.00	16.52

TCE\CIS

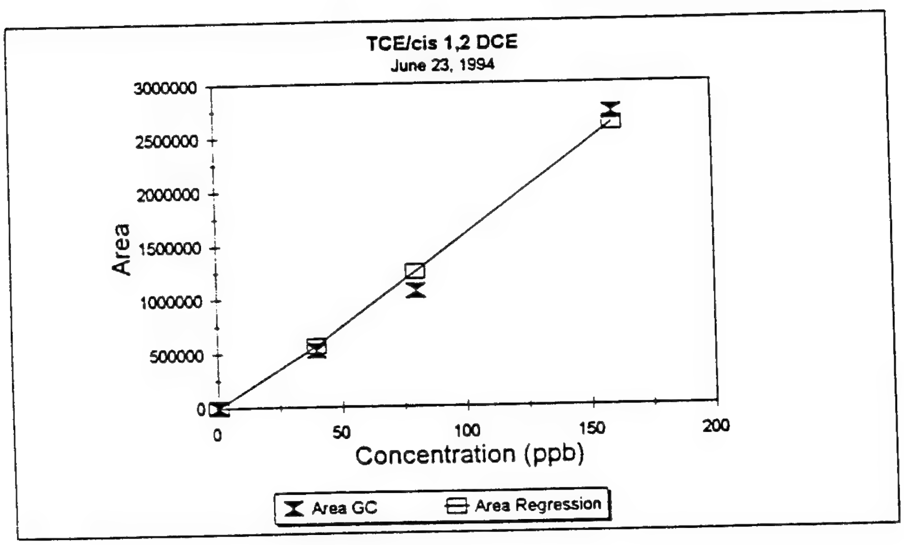
June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
TCE\CIS	160.00	2718065.00	16987.91	14468.99
TCE\CIS	80.00	1071216.00	13390.20	
TCE\CIS	40.00	521154.00	13028.85	
TCE\CIS	0.00	0.00	0.00	

Regression Output:

Constant		-120908.20
Std Err of Y Est		170143.42
R Squared		0.99
No. of Observations		4.00
Degrees of Freedom		2.00
X Coefficient(s)	17121.67	
Std Err of Coef.	1437.97	



TCE\CIS

June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Date & time	TCE\CIS Trace#	area	Conc	%RSD
6/24/94 08:07	188	1205826.00	80.00	4.17
6/24/94 11:50	196	911881.00	80.00	21.22
6/24/94 15:42	202	1219984.00	80.00	5.40
6/24/94 17:32	207	1046555.00	80.00	9.59
6/25/94 08:49	210	1079713.00	80.00	6.72
6/25/94 10:09	213	891233.00	80.00	23.00
6/25/94 12:15	219	846145.00	80.00	26.90
6/25/94 16:01	227	903373.00	80.00	21.96
6/25/94 17:19	231	887125.00	80.00	23.36
6/26/94 08:40	235	1039053.00	80.00	10.23
6/26/94 10:49	240	2361545.00	160.00	2.01
6/26/94 12:07	243	630353.00	80.00	45.54
6/26/94 15:41	249		80.00	
6/27/94 10:01	255	1308588.00	80.00	13.05
6/27/94 12:03	261	1198511.00	80.00	3.54
6/27/94 15:14	270	764961.00	80.00	33.91
6/27/94 18:18	277	830103.00	80.00	28.29
6/28/94 08:09	279	0.00	80.00	
6/28/94 11:21	286	0.00	80.00	
6/28/94 14:08	292	1349847.00	80.00	16.62
6/28/94 14:45	293	3245539.00	80.00	180.39
6/28/94 16:18	297	410769.00	80.00	64.51
6/28/94 17:01	299	1603880.00	80.00	38.56
6/29/94 08:49	302		80.00	
6/29/94 12:59	306	1123995.00	80.00	2.90
6/29/94 15:27	312	1741502.00	120.00	0.30
6/29/94 17:45	317	639966.00	80.00	44.71
6/30/94 08:05	319	1296972.00	80.00	12.05
6/30/94 10:05	325	1673605.00	80.00	44.59
6/30/94 13:08	332	1961539.00	80.00	69.46
6/30/94 13:50	334	967565.00	80.00	16.41

PCE

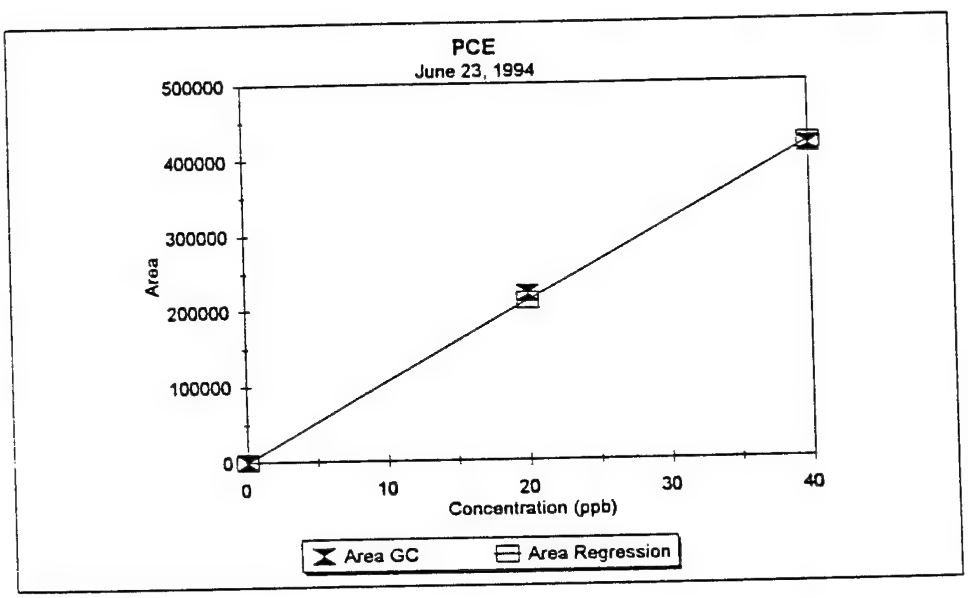
June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				10697.36
PCE	40.00	414401.00	10360.03	
PCE	20.00	220694.00	11034.70	
PCE	0.00	0.00	0.00	

Regression Output:

Constant		4497.83
Std Err of Y Est		11017.40
R Squared		1.00
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	10360.03	
Std Err of Coef.	389.52	



PCE

June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Date & time	Trace#	area	Conc	%RSD
6/24/94 08:07	188	499554.00	40.00	16.75
6/24/94 11:50	188	432314.00	40.00	1.03
6/24/94 15:42	196	311200.00	40.00	27.27
6/24/94 17:32	202	378352.00	40.00	11.58
6/25/94 08:49	207	309504.00	40.00	27.67
6/25/94 10:09	210	185913.00	40.00	56.55
6/25/94 12:15	213	135887.00	40.00	68.24
6/25/94 16:01	219	458270.00	40.00	7.10
6/25/94 17:19	227	349202.00	40.00	18.39
6/26/94 08:40	231	433254.00	40.00	1.25
6/26/94 10:49	234	261304.00	40.00	38.93
6/26/94 12:07	240	632921.00	80.00	26.04
6/26/94 15:41	243	194398.00	40.00	54.57
6/27/94 10:01	249	237650.00	40.00	44.46
6/27/94 12:03	255	447302.00	40.00	4.54
6/27/94 15:14	261	432201.00	40.00	1.01
6/27/94 18:18	270	282439.00	40.00	33.99
6/28/94 08:09	277	404603.00	40.00	5.44
6/28/94 11:21	279	195128.00	40.00	54.40
6/28/94 14:08	283	1432977.00	75.00	78.61
6/28/94 14:45	286	398429.00	40.00	6.89
6/28/94 16:18	292	496720.00	40.00	16.08
6/28/94 17:01	293	643483.00	40.00	50.38
6/29/94 08:49	297	191108.00	40.00	55.34
6/29/94 12:59	299	365736.00	40.00	14.53
6/29/94 15:27	302	153059.00	40.00	64.23
6/29/94 17:45	306	318883.00	40.00	25.48
6/30/94 08:05	312	761273.00	60.00	18.61
6/30/94 10:05	317	288301.00	40.00	32.62
6/30/94 13:08	319	455497.00	40.00	6.45
6/30/94 13:50	325	505664.00	40.00	18.17
	332	527961.00	40.00	23.39
	334	237028.00	40.00	44.61

Toluene

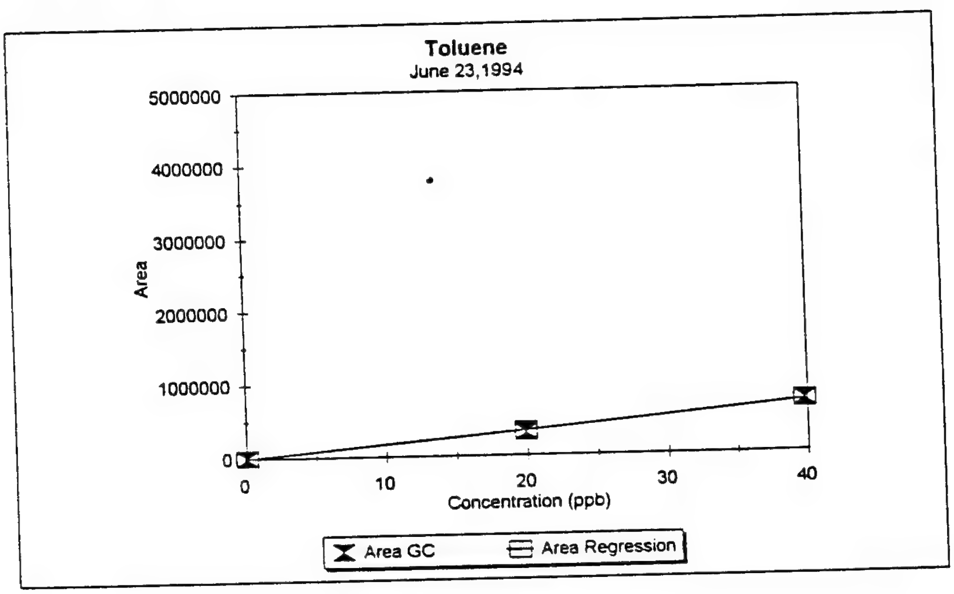
June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				16751.14
Toluene	39.81	708476.00	17796.88	
Toluene	19.90	312608.00	15705.39	
Toluene	0.00	0.00	0.00	

Regression Output:

Constant		-13876.67
Std Err of Y Est		33990.75
R Squared		1.00
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	17796.88	
Std Err of Coef.	1207.52	



Toluene

June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Date & time	Toluene Trace#	area	Conc	%RSD
6/24/94 08:07	188	791302.00	39.80	18.69
6/24/94 11:50	196	587568.00	39.80	11.87
6/24/94 15:42	202	821983.00	39.80	23.29
6/24/94 17:32	207	650143.00	39.80	2.48
6/25/94 08:49	210	557492.00	39.80	16.38
6/25/94 10:09	213	435581.00	39.80	34.67
6/25/94 12:15	219	563861.00	39.80	15.43
6/25/94 16:01	227	526518.00	39.80	21.03
6/25/94 17:19	231	538957.00	39.80	19.16
6/26/94 08:40	234	515262.00	39.80	22.71
6/26/94 10:49	240	1404650.00	79.60	5.34
6/26/94 12:07	243	300203.00	39.80	54.97
6/26/94 15:41	249	630159.00	39.80	5.48
6/27/94 10:01	255	901550.00	39.80	35.23
6/27/94 12:03	261	750849.00	39.80	12.62
6/27/94 15:14	270	422115.00	39.80	36.69
6/27/94 18:18	277	570785.00	39.80	14.39
6/28/94 08:09	279	854196.00	39.80	28.12
6/28/94 11:21	286	824187.00	39.80	23.62
6/28/94 14:08	290	385991.00	39.80	42.10
6/28/94 14:45	297	527016.00	39.80	20.95
6/28/94 16:18	300	703063.00	39.80	5.45
6/28/94 17:01	302	1004998.00	39.80	50.74
6/29/94 08:49	306	545883.00	39.80	18.12
6/29/94 12:59	312	1231240.00	59.70	23.12
6/29/94 15:27	317	396108.00	39.80	40.59
6/29/94 17:45	319	704981.00	39.80	5.74
6/30/94 08:05	325	1025128.00	39.80	53.76
6/30/94 10:05	332	1140213.00	39.80	71.02
6/30/94 13:08	334	497876.00	39.80	25.32
6/30/94 13:50				

chloro/ethylbenzene

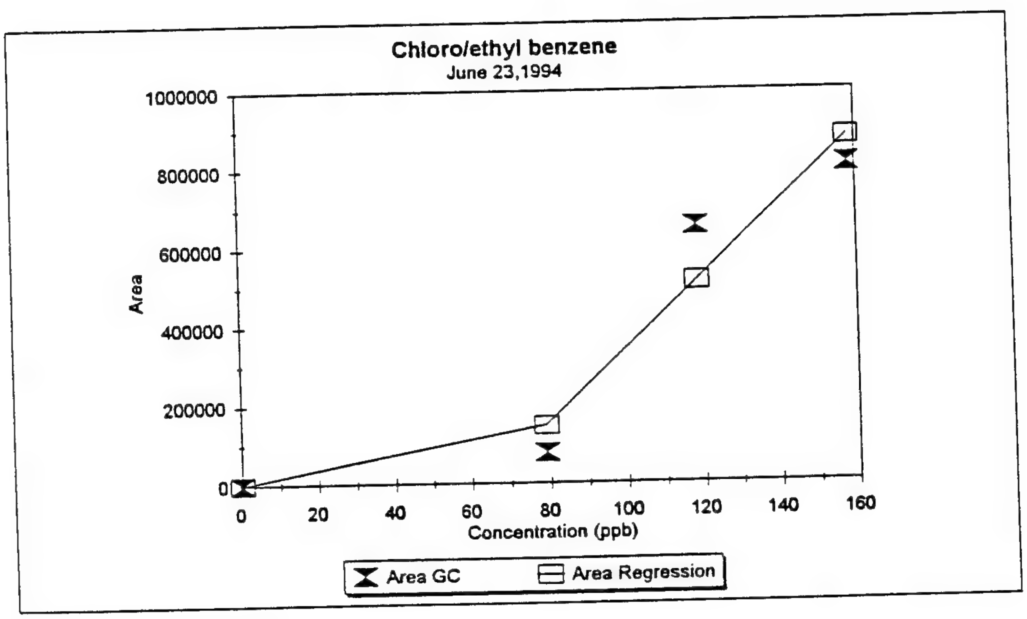
June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
chloro/ethylbenzene	158.04	809506.00	5122.28	3878.29
chloro/ethylbenzene	118.53	652991.00	5509.20	
chloro/ethylbenzene	79.02	79285.00	1003.38	
chloro/ethylbenzene	0.00	0.00	0.00	

Regression Output:

Constant		-581404.17
Std Err of Y Est		170317.51
R Squared		0.90
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	9241.17	
Std Err of Coef.	3048.23	



chloro/ethylbenzene

June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Date & time	Trace#	area	Conc	%RSD
6/24/94 08:07	188	88587.00	79.02	71.09
6/24/94 11:50	196	134955.00	79.02	55.96
6/24/94 15:42	202	93073.00	79.02	69.63
6/24/94 17:32	207	137808.00	79.02	55.03
6/25/94 08:49	210	43684.00	79.02	85.75
6/25/94 10:09	213	387407.00	79.02	26.42
6/25/94 12:15	219	310607.00	79.02	1.35
6/25/94 16:01	227	96247.00	79.02	68.59
6/25/94 17:19	231	156117.00	79.02	49.06
6/26/94 08:40	234	273119.00	79.02	10.88
6/26/94 10:49	240	143474.00	158.04	76.59
6/26/94 12:07	243	110272.00	79.02	64.02
6/26/94 15:41	249	79285.00	79.02	74.13
6/27/94 10:01	255	211194.00	79.02	31.08
6/27/94 12:03	261	99244.00	79.02	67.62
6/27/94 15:14	270	83344.00	79.02	72.80
6/27/94 18:18	277	111326.00	79.02	63.67
6/28/94 08:09	279	497415.00	79.02	62.31
6/28/94 11:21	286	312275.00	79.02	1.90
6/28/94 14:08	290	210092.00	79.02	31.44
6/28/94 14:45	297	146568.00	79.02	52.17
6/28/94 16:18	300	246054.00	79.02	19.71
6/28/94 17:01	302	119181.00	79.02	61.11
6/29/94 08:49	306	132173.00	79.02	56.87
6/29/94 12:59	312	215065.00	118.53	53.21
6/29/94 15:27	317	162232.00	79.02	47.06
6/29/94 17:45	319	161908.00	79.02	47.17
6/30/94 08:05	325	249580.00	79.02	18.56
6/30/94 10:05	332	223837.00	79.02	26.96
6/30/94 13:08	334	107973.00	79.02	64.77
6/30/94 13:50				

p-xylene

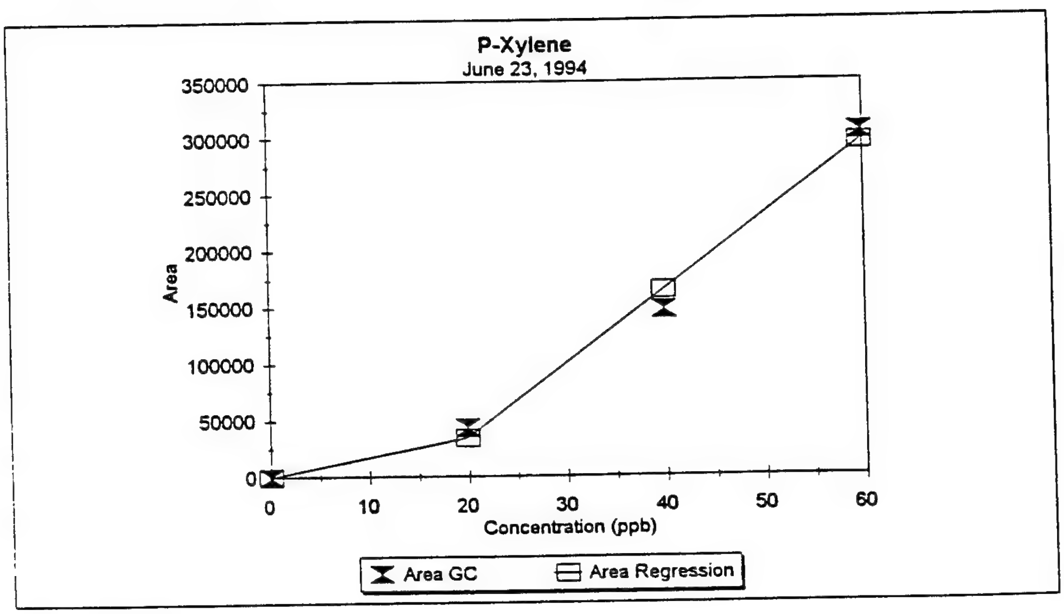
June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				3664.78
p-xylene	59.71	304729.00	5103.18	
p-xylene	39.81	147651.00	3708.99	
p-xylene	19.90	43435.00	2182.17	
p-xylene	0.00	0.00	0.00	

Regression Output:

Constant		-96022.33
Std Err of Y Est		21580.82
R Squared		0.99
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	6563.69	
Std Err of Coef.	766.66	



p-xylene

June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Date & time	Trace#	area	Conc	%RSD
6/24/94 08:07	188	38061.00	39.82	73.92
6/24/94 11:50	196	136888.00	39.82	6.19
6/24/94 15:42	202	151823.00	39.82	4.04
6/24/94 17:32	207	125253.00	39.82	14.16
6/25/94 08:49	210	7496.00	39.82	94.86
6/25/94 10:09	213	46768.00	39.82	67.95
6/25/94 12:15	219	125163.00	39.82	14.23
6/25/94 16:01	227	124874.00	39.82	14.42
6/25/94 17:19	231	138184.00	39.82	5.30
6/26/94 08:40	234	49759.00	39.82	65.90
6/26/94 10:49	240	271406.00	79.63	7.00
6/26/94 12:07	243	38350.00	39.82	73.72
6/26/94 15:41	249	187812.00	39.82	28.71
6/27/94 10:01	255	83634.00	39.82	42.69
6/27/94 12:03	261	119629.00	39.82	18.02
6/27/94 15:14	270	76964.00	39.82	47.26
6/27/94 18:18	277	88791.00	39.82	39.15
6/28/94 08:09	279	145308.00	39.82	0.42
6/28/94 11:21	286	209403.00	39.82	43.50
6/28/94 14:08	290	48648.00	39.82	66.66
6/28/94 14:45	297	99046.00	39.82	32.12
6/28/94 16:18	300	110919.00	39.82	23.99
6/28/94 17:01	302	158431.00	39.82	8.57
6/29/94 08:49	306	103388.00	39.82	29.15
6/29/94 12:59	312	191646.00	59.73	12.44
6/29/94 15:27	317	73073.00	39.82	49.92
6/29/94 17:45	319	52553.00	39.82	63.99
6/30/94 08:05	325	103751.00	39.82	28.90
6/30/94 10:05	332	91941.00	39.82	36.99
6/30/94 13:08	334	114531.00	39.82	21.51
6/30/94 13:50				

o-xylene

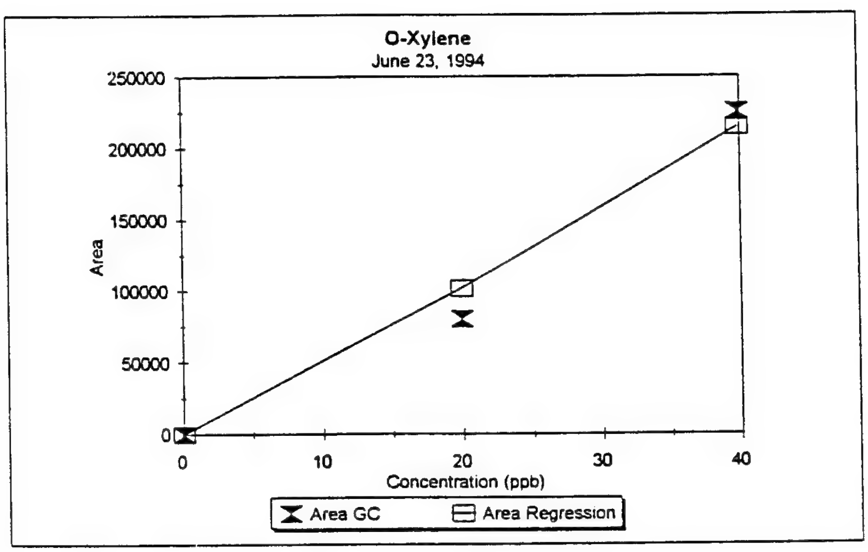
June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Analyte	Conc (μg/L)	Area Area counts	RF Area counts/(μg/L)	AVG RF Area counts/(μg/L)
				4851.79
o-xylene	39.81	225558.00	5666.01	
o-xylene	19.90	80366.00	4037.58	
o-xylene	0.00	0.00	0.00	

Regression Output:

Constant		-10804.33
Std Err of Y Est		26465.10
R Squared		0.97
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	5666.01	
Std Err of Coef.	940.17	



o-xylene

June 23, 1994

Calibration standards were used to calibrate samples analyzed June 23, 1994 Traces 187-333

Date & time	Trace#	area	Conc	%RSD
6/24/94 08:07	196	164027.00	39.82	15.09
6/24/94 11:50	202	180486.00	39.82	6.57
6/24/94 15:42	207	150465.00	39.82	22.11
6/24/94 17:32	210	39141.00	39.82	79.74
6/25/94 08:49	213	95541.00	39.82	50.54
6/25/94 10:09	219	123703.00	39.82	35.96
6/25/94 12:15	227	169339.00	39.82	12.34
6/25/94 16:01	231	142320.00	39.82	26.33
6/25/94 17:19	234	84989.00	39.82	56.00
6/26/94 08:40	240	325565.00	79.63	15.73
6/26/94 10:49	243	32692.00	39.82	83.08
6/26/94 12:07	249	169039.00	39.82	12.49
6/26/94 15:41	255	100807.00	39.82	47.82
6/27/94 10:01	261	128192.00	39.82	33.64
6/27/94 12:03	270	91845.00	39.82	52.45
6/27/94 15:14	277	87915.00	39.82	54.49
6/27/94 18:18	279	153927.00	39.82	20.32
6/28/94 08:09	286	196788.00	39.82	1.87
6/28/94 11:21	297	90666.00	39.82	53.07
6/28/94 14:08	300	106505.00	39.82	44.87
6/28/94 14:45	302	156886.00	39.82	18.79
6/28/94 16:18	306	107854.00	39.82	44.17
6/28/94 17:01	312	213393.00	59.72	26.36
6/29/94 08:49	317	67377.00	39.82	65.12
6/29/94 12:59	319	80496.00	39.82	58.33
6/29/94 15:27	325	148768.00	39.82	22.99
6/29/94 17:45	332	151680.00	39.82	21.48
6/30/94 08:05	334	125227.00	39.82	35.17
6/30/94 10:05				
6/30/94 13:08				
6/30/94 13:50				

Trans 1,2 DCE

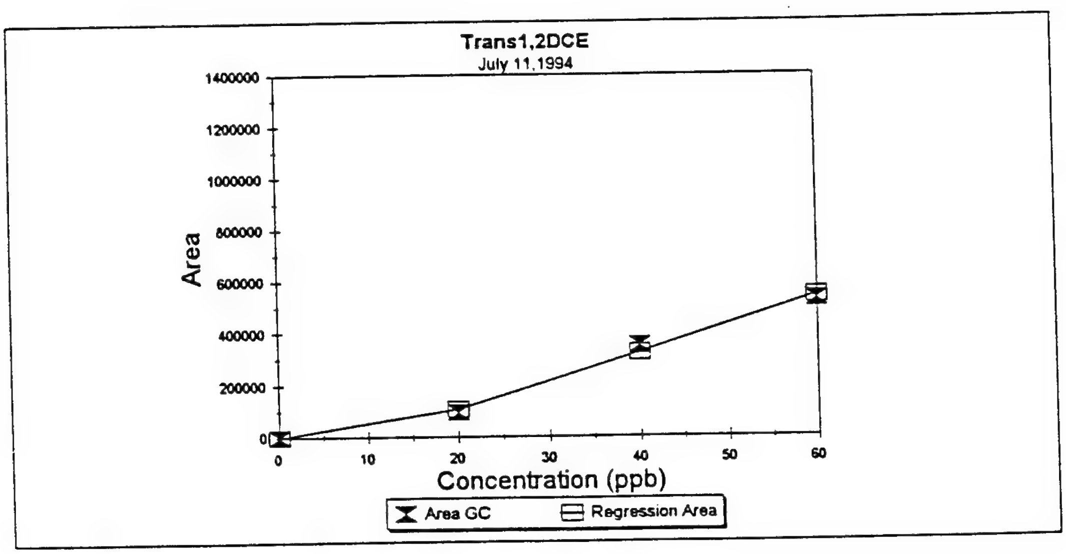
July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				7419.67
Trans 1,2 DCE	60.00	527922.00	8798.70	
Trans 1,2 DCE	40.00	351000.00	8775.00	
Trans 1,2 DCE	20.00	93706.00	4685.30	
Trans 1,2 DCE	0.00	0.00	0.00	

Regression Output:

Constant		-110006.66667
Std Err of Y Est		32811.73160
R Squared		0.98871
No. of Observations		3.00000
Degrees of Freedom		1.00000
X Coefficient(s)	10855.40	
Std Err of Coef.	1160.07	



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TRANS

Trans 1,2 DCE

July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Date & time	Trace#	area	Conc	%RSD
7/11/94 18:29	374	541830.00	40.00	82.57
7/12/94 09:25	381	387351.00	40.00	30.51
7/12/94 11:53	386	300353.00	40.00	1.20
7/12/94 17:36	395	392004.00	40.00	32.08
7/12/94 18:56	399	532531.00	40.00	79.43
7/12/94 21:19	408	335465.00	40.00	13.03
7/13/94 08:25	410	375074.00	40.00	26.38
7/13/94 11:09	422	356705.00	40.00	20.19
7/13/94 14:06	432	390376.00	40.00	31.53
7/13/94 16:25	440	326843.00	40.00	10.13
7/14/94 08:07	443	355094.00	40.00	19.65
7/14/94 12:31	445	290678.00	40.00	2.06
7/14/94 14:53	450	288950.00	40.00	2.64
7/14/94 18:33	459	442473.00	40.00	49.09
7/15/94 08:08	462	155935.00	40.00	47.46
7/15/94 08:53	464	330950.00	40.00	11.51
7/15/94 10:58	472	230003.00	40.00	22.50
7/15/94 11:11	473	451115.00	40.00	52.00
7/15/94 14:45	482	363648.00	40.00	22.53
7/16/94 10:44	500	204012.00	40.00	31.26

cis 1,2 DCE

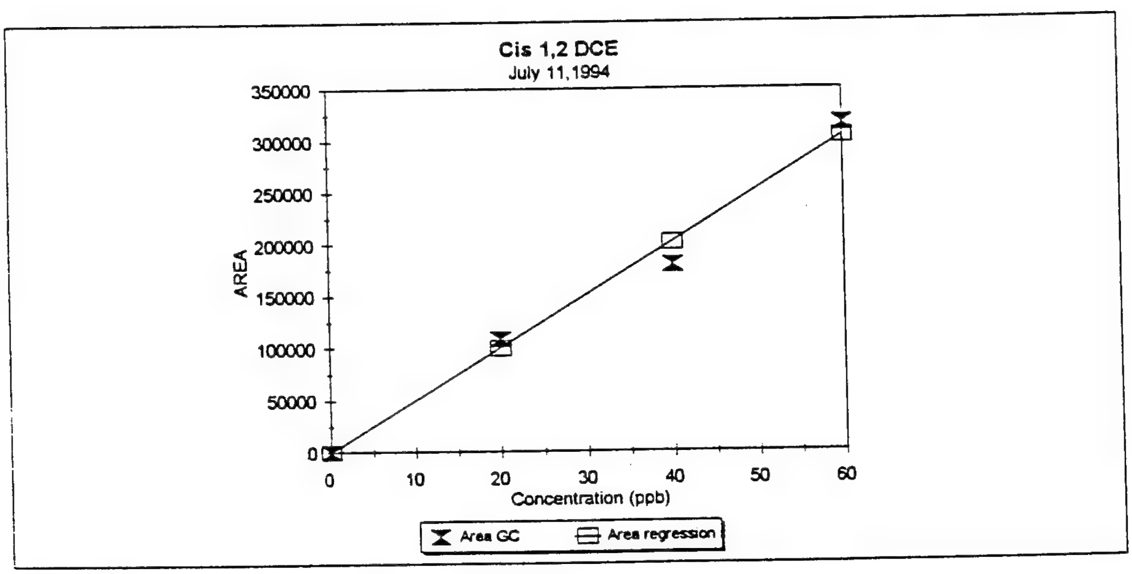
July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Analyte	Conc (μg/L)	Area Area counts	RF Area counts/(μg/L)	AVG RF Area counts/(μg/L)
				5069.58
cis 1,2 DCE	60.00	315951.00	5265.85	
cis 1,2 DCE	40.00	180212.00	4505.30	
cis 1,2 DCE	20.00	108752.00	5437.60	
cis 1,2 DCE	0.00	0.00	0.00	

Regression Output:

Constant		-1668.20
Std Err of Y Est		18680.31
R Squared		0.99
No. of Observations		4.00
Degrees of Freedom		2.00
X Coefficient(s)	5096.56	
Std Err of Coef.	417.70	



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CIS

cis 1,2 DCE

July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Date & time	Trace#	area	Conc	%RSD
7/11/94 18:44	375	515482.00	40.00	154.20
7/12/94 08:37	378	223064.00	40.00	10.00
7/12/94 12:08	387	461374.00	40.00	127.52
7/12/94 17:52	396	333012.00	40.00	64.22
7/12/94 19:12	400	545927.00	40.00	169.22
7/13/94 08:40	411	286964.00	40.00	41.51
7/13/94 11:25	423	232384.00	40.00	14.60
7/13/94 14:23	433	278729.00	40.00	37.45
7/13/94 16:40	441	258202.00	40.00	27.33
7/14/94 08:23	444	262660.00	40.00	29.53
7/14/94 12:46	446	272765.00	40.00	34.51
7/14/94 15:07	451	268253.00	40.00	32.29
7/14/94 18:48	460	378576.00	40.00	86.69
7/15/94 08:23	463	136284.00	40.00	32.79
7/15/94 09:09	465	235696.00	40.00	16.23
7/15/94 11:25	474	232931.00	40.00	14.87
7/15/94 15:01	483	225180.00	40.00	11.04
7/15/94 19:20	495	222236.00	40.00	9.59
7/16/94 10:21	498	226434.00	40.00	11.66

TCE

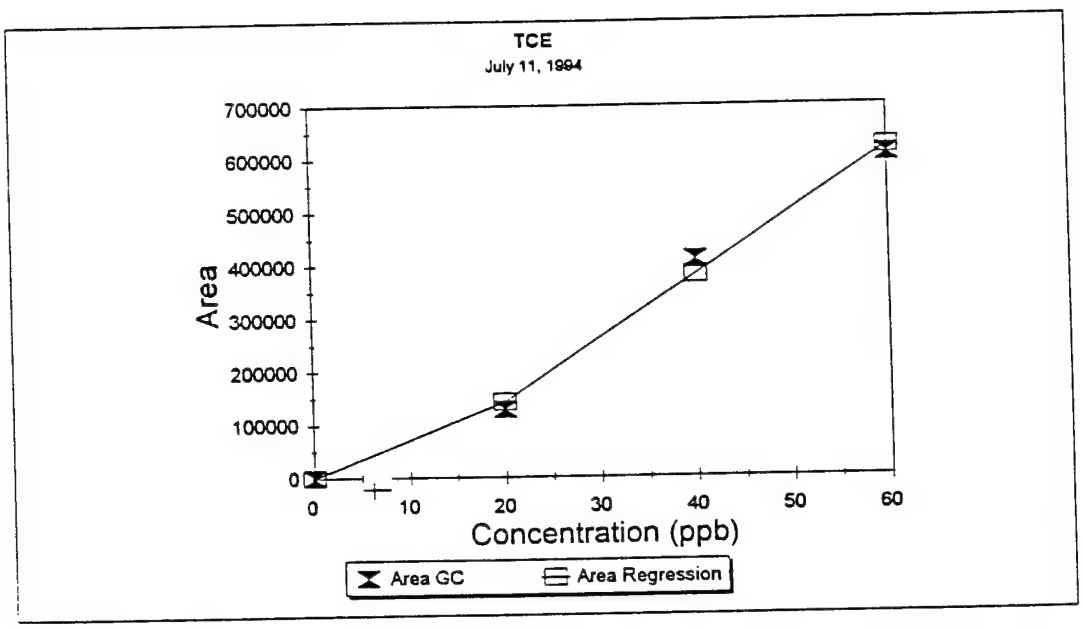
July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				8947.35
TCE	60.00	607172.00	10119.53	
TCE	40.00	410767.00	10269.18	
TCE	20.00	129067.00	6453.35	
TCE	0.00	0.00	0.00	

Regression Output:

Constant		-95769.67
Std Err of Y Est		34821.54
R Squared		0.99
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	11952.62	
Std Err of Coef.	1231.13	



TCE

July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Date & time	TCE Trace#	area	Conc	%RSD
7/11/94 18:29	374	713002.00	40.00	99.22
7/12/94 09:25	381	410100.00	40.00	14.59
7/12/94 11:53	386	308605.00	40.00	13.77
7/12/94 17:36	395	447555.00	40.00	25.05
7/12/94 18:56	399	592340.00	40.00	65.51
7/12/94 21:19	408	442672.00	40.00	23.69
7/13/94 08:25	410	387391.00	40.00	8.24
7/13/94 11:09	422	364727.00	40.00	1.91
7/13/94 14:06	432	365230.00	40.00	2.05
7/13/94 16:25	440	334542.00	40.00	6.52
7/14/94 08:07	443	334561.00	40.00	6.52
7/14/94 12:31	445	416779.00	40.00	16.45
7/14/94 14:53	450	294684.00	40.00	17.66
7/14/94 18:33	459	660864.00	40.00	84.65
7/15/94 08:08	462	215910.00	40.00	39.67
7/15/94 08:53	464	342378.00	40.00	4.34
7/15/94 10:58	472	259466.00	40.00	27.50
7/15/94 11:11	473	444555.00	40.00	24.21
7/15/94 14:45	482	383649.00	40.00	7.20
7/16/94 10:44	500	198692.00	40.00	44.48

PCE

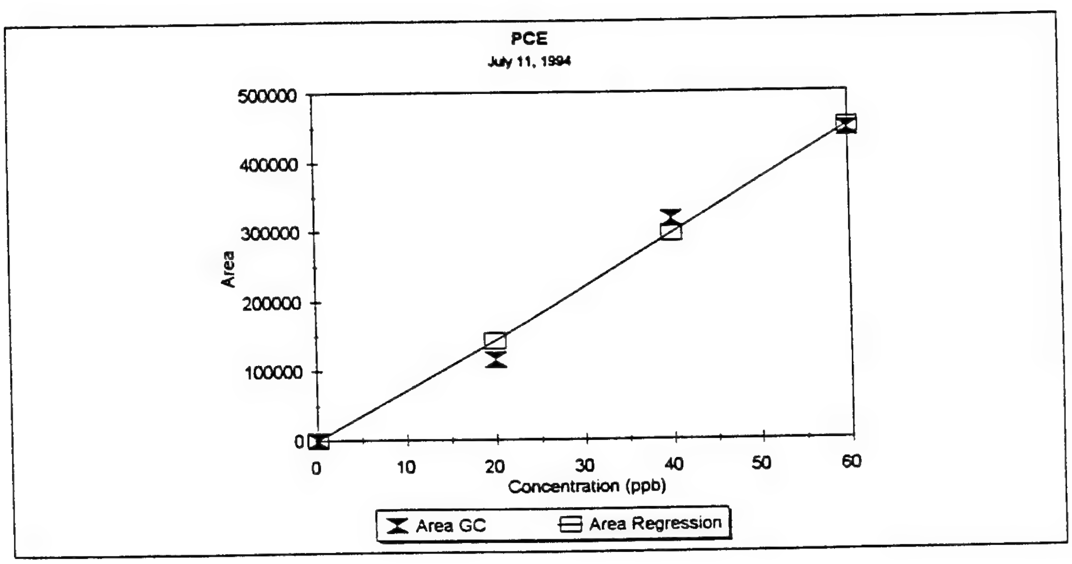
July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				7047.04
PCE	60.00	446214.00	7436.90	
PCE	40.00	317115.00	7927.88	
PCE	20.00	115527.00	5776.35	
PCE	0.00	0.00	0.00	

Regression Output:

Constant		-11320.50
Std Err of Y Est		25524.06
R Squared		0.99
No. of Observations		4.00
Degrees of Freedom		2.00
X Coefficient(s)	7701.15	
Std Err of Coef.	570.74	



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PCE

July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Date & time	PCE Trace#	area	Conc	%RSD
7/11/94 18:29	374	373632.00	40.00	32.55
7/12/94 09:25	381	402254.00	40.00	42.70
7/12/94 11:53	386	234876.00	40.00	16.68
7/12/94 17:36	395	353982.00	40.00	25.58
7/12/94 18:56	399	397589.00	40.00	41.05
7/12/94 21:19	408	284653.00	40.00	0.98
7/13/94 08:25	410	297596.00	40.00	5.57
7/13/94 11:09	422	242785.00	40.00	13.87
7/13/94 14:06	432	378433.00	40.00	34.25
7/13/94 16:25	440	322045.00	40.00	14.25
7/14/94 08:07	443	310243.00	40.00	10.06
7/14/94 12:31	445	236588.00	40.00	16.07
7/14/94 14:53	450	295747.00	40.00	4.92
7/14/94 18:33	459	311799.00	40.00	10.61
7/15/94 08:08	462	143695.00	40.00	49.02
7/15/94 08:53	464	337496.00	40.00	19.73
7/15/94 10:58	472	260046.00	40.00	7.75
7/15/94 11:11	473	462271.00	40.00	63.99
7/15/94 14:45	482	358973.00	40.00	27.35
7/16/94 10:44	500	212795.00	40.00	24.51

Toluene

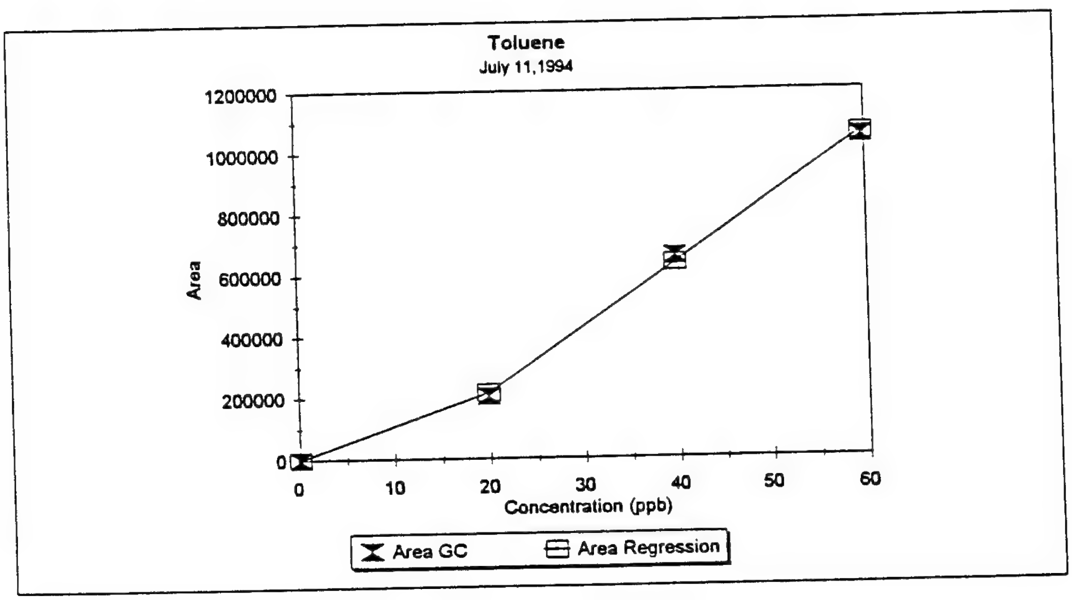
July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				14773.49
Toluene	59.71	1045702.00	17511.99	
Toluene	39.81	658037.00	16529.86	
Toluene	19.90	204591.00	10278.63	
Toluene	0.00	0.00	0.00	

Regression Output:

Constant		-205001.00
Std Err of Y Est		26854.98
R Squared		1.00
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	21128.66	
Std Err of Coef.	954.02	



Toluene

July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

	TOLUENE			
Date & time	Trace#	area	Conc	%RSD
7/11/94 18:29	374	1175236.00	39.80	99.87
7/12/94 09:25	381	781649.00	39.80	32.94
7/12/94 11:53	386	489056.00	39.80	16.83
7/12/94 17:36	395	771805.00	39.80	31.26
7/12/94 18:56	399	1068622.00	39.80	81.74
7/12/94 21:19	408	832719.00	39.80	41.62
7/13/94 08:25	410	724578.00	39.80	23.23
7/13/94 11:09	422	670505.00	39.80	14.03
7/13/94 14:06	432	687882.00	39.80	16.99
7/13/94 16:25	440	582538.00	39.80	0.93
7/14/94 08:07	443	566146.00	39.80	3.71
7/14/94 12:31	445	532566.00	39.80	9.43
7/14/94 14:53	450	593398.00	39.80	0.92
7/14/94 18:33	459	997612.00	39.80	69.67
7/15/94 08:08	462	358444.00	39.80	39.04
7/15/94 08:53	464	579922.00	39.80	1.37
7/15/94 10:58	472	424428.00	39.80	27.82
7/15/94 11:11	473	815752.00	39.80	38.74
7/15/94 14:45	482	633101.00	39.80	7.67
7/16/94 10:06	497	619408.00	39.80	5.34

chloro/ethylbenzene

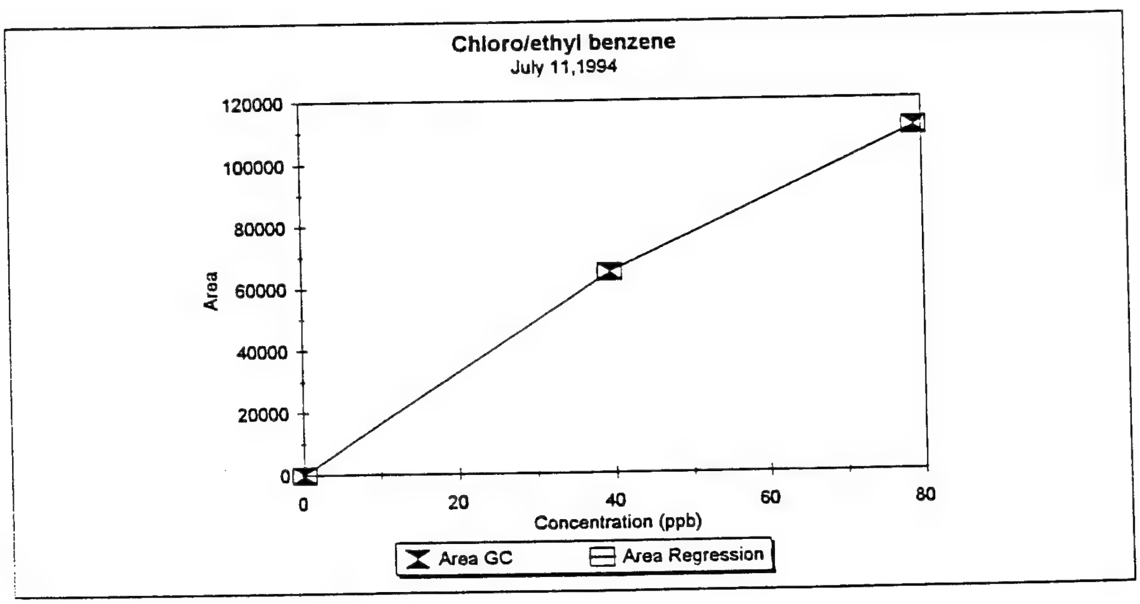
July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				1522.29
chloro/ethylbenzene	79.02	110962.00	1404.26	
chloro/ethylbenzene	39.51	64808.00	1640.33	
chloro/ethylbenzene	0.00	0.00	0.00	

Regression Output:

Constant		18654.00
Std Err of Y Est		ERR
R Squared		1.00
No. of Observations		2.00
Degrees of Freedom		0.00
X Coefficient(s)	1168.19	
Std Err of Coef.	ERR	



chloro/ethylbenzene

July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

	CHLORO-ETHYL			
Date & time	Trace#	area	Conc	%RSD
7/11/94 18:29	374	65182.00	79.02	45.81
7/12/94 09:25	381	94768.00	79.02	21.22
7/12/94 11:53	386	103899.00	79.02	13.63
7/12/94 17:36	395	126440.00	79.02	5.11
7/12/94 18:56	399	147034.00	79.02	22.23
7/12/94 21:19	408	172647.00	79.02	43.53
7/13/94 08:25	410	211871.00	79.02	76.13
7/13/94 11:09	422	37177.00	79.02	69.09
7/13/94 14:06	432	147274.00	79.02	22.43
7/13/94 16:25	440	85261.00	79.02	29.12
7/14/94 08:07	443	71482.00	79.02	40.57
7/14/94 12:31	445	66033.00	79.02	45.10
7/14/94 14:53	450	130702.00	79.02	8.66
7/14/94 18:33	459	32375.00	79.02	73.09
7/15/94 08:08	462	19007.00	79.02	84.20
7/15/94 08:53	464	50014.00	79.02	58.42
7/15/94 10:58	472	47025.00	79.02	60.91
7/15/94 11:11	473	61713.00	79.02	48.70
7/15/94 14:45	482	53553.00	79.02	55.48
7/16/94 10:06	497	54270.00	79.02	54.88

p-xylene

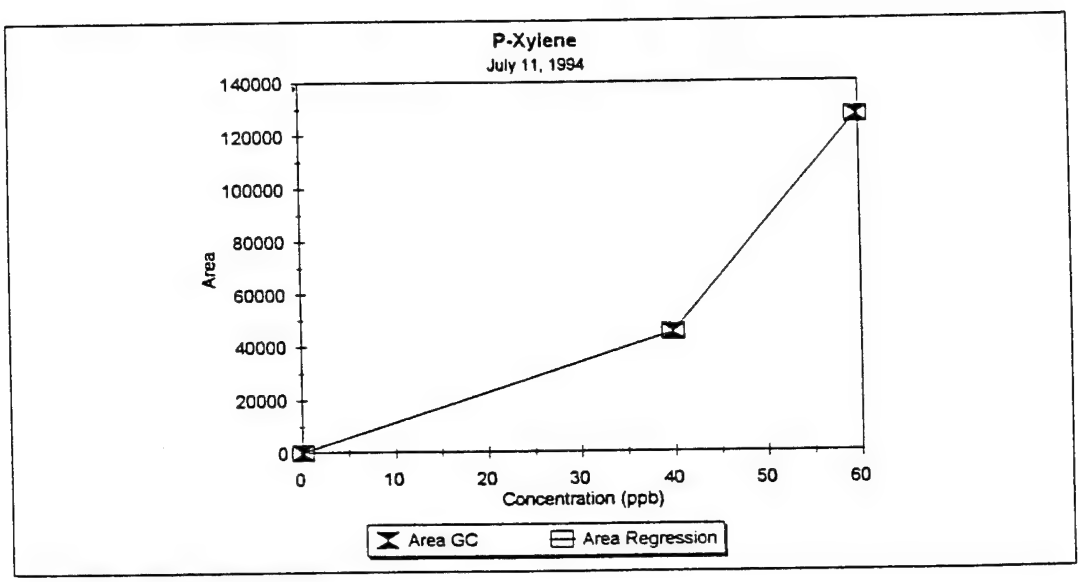
July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L) 1633.88
p-xylene	59.71	127235.00	2130.76	
p-xylene	39.81	45263.00	1137.00	
p-xylene	0.00	0.00	0.00	

Regression Output:

Constant	-118681.00
Std Err of Y Est	ERR
R Squared	1.00
No. of Observations	2.00
Degrees of Freedom	0.00
X Coefficient(s)	4118.26
Std Err of Coef.	ERR



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Date & time	P-XYLENE Trace#	area	Conc	%RSD

p-xylene

July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

7/11/94 18:29	374	52964.00	39.82	18.59
7/12/94 09:25	381	86748.00	39.82	33.34
7/12/94 11:53	386	88424.00	39.82	35.92
7/12/94 17:36	395	105097.00	39.82	61.55
7/12/94 18:56	399	90804.00	39.82	39.58
7/12/94 21:19	408	165894.00	39.82	155.00
7/13/94 08:25	410	60401.00	39.82	7.16
7/13/94 11:09	422	47084.00	39.82	27.63
7/13/94 14:06	432	77219.00	39.82	18.70
7/13/94 16:25	440	63228.00	39.82	2.81
7/14/94 08:07	443	26684.00	39.82	58.98
7/14/94 12:31	445	32153.00	39.82	50.58
7/14/94 14:53	450	56614.00	39.82	12.98
7/14/94 18:33	459	42126.00	39.82	35.25
7/15/94 08:08	462		39.82	100.00
7/15/94 08:53	464	15199.00	39.82	76.64
7/15/94 10:58	472	13872.00	39.82	78.68
7/15/94 11:11	473	30099.00	39.82	53.73
7/15/94 14:45	482	17230.00	39.82	73.52
7/15/94 19:05	494	26766.00	39.82	58.86

o-xylene

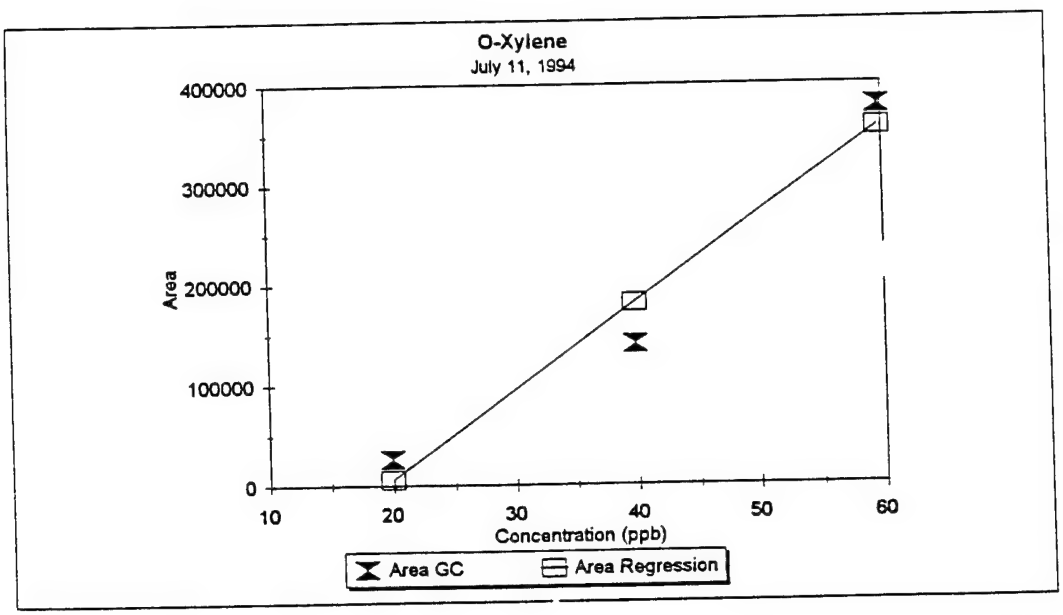
July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Analyte	Conc (µg/L)	Area Area counts	RF Area counts/(µg/L)	AVG RF Area counts/(µg/L)
				3735.02
o-xylene	59.71	377932.00	6329.09	
o-xylene	39.81	140334.00	3525.18	
o-xylene	19.90	26887.00	1350.80	
o-xylene	0.00	0.00	0.00	

Regression Output:

Constant		-169327.33
Std Err of Y Est		50684.43
R Squared		0.96
No. of Observations		3.00
Degrees of Freedom		1.00
X Coefficient(s)	8818.23	
Std Err of Coef.	1800.56	



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O-XYLENE

o-xylene

July 11, 1994

Calibration standards were used tocalibrate samples analyzed on or after July 11, 1994

Date & time	Trace#	area	Conc	%RSD
7/11/94 18:29	374	88574.00	39.82	40.44
7/12/94 09:25	381	100897.00	39.82	32.15
7/12/94 11:53	386	102222.00	39.82	31.26
7/12/94 17:36	395	125087.00	39.82	15.89
7/12/94 18:56	399	133441.00	39.82	10.27
7/12/94 21:19	408	209725.00	39.82	41.03
7/13/94 08:25	410	61868.00	39.82	58.40
7/13/94 11:09	422	52508.00	39.82	64.69
7/13/94 14:06	432	86238.00	39.82	42.01
7/13/94 16:25	440	73981.00	39.82	50.25
7/14/94 08:07	443	36902.00	39.82	75.19
7/14/94 12:31	445	37903.00	39.82	74.51
7/14/94 14:53	450	65084.00	39.82	56.23
7/14/94 18:33	459	60804.00	39.82	59.11
7/15/94 08:08	462	3290.00	39.82	97.79
7/15/94 08:53	464	18872.00	39.82	87.31
7/15/94 10:58	472		39.82	100.00
7/15/94 11:11	473	39912.00	39.82	73.16
7/15/94 14:45	482	18866.00	39.82	87.31
7/15/94 19:05	494	20179.00	39.82	86.43

APPENDIX C

CALCULATED DATA AND QA

AMPLE ANALYSES TRACES 103-111

lethod Detection Limits

Compound	Concentration µg/L
TRANS 1,2 DCE	34.00
BENZENE	4.00
CIS 1,2 DCE	23.00
TCE	4.00
PCE	4.70
TOLUENE	3.70
CHLORO/ETHYLBENZENE	8.20
p-XYLENE	6.80
o-XYLENE	5.60

SAMPLE ID: BC-B-SG1-A
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 1127
GC TRACE#: 103

Analyte	Conc µg/	Qualifier
Trans 1,2 DCE	34.00	U
benzene	4.00	U
Cis 1,2 DCE	23.00	U
TCE/CIS 1,2 DCE	5.25	J
PCE	4.70	U
Toluene	3.70	U
chloro/ethylbenzene	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-B-SG1-B
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 10
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 1223
GC TRACE#: 106

BC-B-SG-1B

Analyte	Conc µg/L
Trans 1,2 DCE	34.00 U
benzene	4.00 U
Cis 1,2 DCE	23.00 U
TCE/CIS 1,2 DCE	4.00 U
PCE	4.70 U
Toluene	45.83
chloro/ethylbenzene	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-B-SG1-C
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 25
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 1253
GC TRACE#: 107
GC crashed, sample lost

Analyte	Conc µg/L
Trans 1,2 DCE	NA
benzene	NA
TCE/CIS 1,2 DCE	NA
PCE	NA
Toluene	NA
chloro/ethylbenzene	NA
p-xylene	NA

SAMPLE ANALYSES TRACES 103-111

o-xylene	NA

SAMPLE ID: BC-D-SG1-A
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 1330
GC TRACE#: 109

Analyte	Conc µg/L
Trans 1,2 DCE	34.00 U
benzene	4.00 U
CIS 1,2 dce	23.00 U
TCE/CIS 1,2 DCE	2.67 J
PCE	4.70 U
Toluene	3.70 U
chloro/ethylbenzene	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG1-B
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 10
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 1455
GC TRACE#: 110

Analyte	Conc µg/L
Trans 1,2 DCE	34.00 U
benzene	4.00 U
cis 1,2 DCE	23.00 U
TCE/CIS 1,2 DCE	15.75
PCE	4.70 U
Toluene	3.70 U
chloro/ethylbenzene	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG1-C
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 20
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 1517
GC TRACE#: 111

Analyte	Conc µg/L
Trans 1,2 DCE	34.00 U
benzene	4.00 U
cis 1,2 DCE	23.00 U
TCE/CIS 1,2 DCE	7.49
PCE	4.70 U
Toluene	3.70 U
chloro/ethylbenzene	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 119-145

Method Detection Limits

Compound	Concentration µg/L
TRANS 1,2 DCE	34.00
BENZENE	4.00
CIS 1,2 DCE	23.00
TCE	4.00
PCE	4.70
TOLUENE	3.70
CHLORO/ETHYLBENZENE	8.20
p-XYLENE	6.80
o-XYLENE	5.60

SAMPLE ID: BC-A-SG1-A
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 1901
GC TRACE#: 119

Analyte	Conc µg/	Qualifier
Trans 1,2 DCE	34.00	U
benzene	4.00	U
TCE/CIS 1,2 DCE	23.00	U
PCE	4.00	U
Toluene	4.70	U
chloro/ethylbenzene	3.70	U
p-xylene	8.20	U
o-xylene	6.80	U
	5.60	U

SAMPLE ID: BC-A-SG1-B
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 10
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 1922
GC TRACE#: 120

Analyte	Conc µg/L	
Trans 1,2 DCE	34.00	U
benzene	4.00	U
	23.00	U
TCE/CIS 1,2 DCE	4.00	U
PCE	4.70	U
Toluene	3.70	U
chloro/ethylbenzene	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-B-SG-1C
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 20
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 1942
GC TRACE#: 121

BC-B-SG-1C

Analyte	Conc µg/L	
Trans 1,2 DCE	34.00	U
benzene	4.00	U
	23.00	U
TCE/CIS 1,2 DCE	4.00	U
PCE	4.70	U
Toluene	3.70	U
chloro/ethylbenzene	8.20	U

SAMPLE ANALYSES TRACES 119-145

p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-A-SG1-C
SAMPLE DATE: JUNE 21, 1994
SAMPLE DEPTH (Ft): 20
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 21, 1994
ANALYSIS TIME: 2001
GC TRACE#: 122

Analyte	Conc µg/L
Trans 1,2 DCE	34.00 U
benzene	4.00 U
	23.00 U
TCE/CIS 1,2 DCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethylbenzene	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG1-A
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1017
GC TRACE#: 131

ANALYTE	Conc µg/L
trans	34.00 U
	4.00 U
cis	23.00 U
TCE	6.79
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG1-A DUP
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1037
GC TRACE#: 135

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-SG-FB-1
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 3
SAMPLE TYPE: 1 3FT ROD
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1158
GC TRACE#: 136

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	17.64
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U

p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG1-C
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 20
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1223
GC TRACE#: 137

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG1-B
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 10
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1243
GC TRACE#: 138

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-B-SG2
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1342
GC TRACE#: 139

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	1.08 J
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-B-SG3
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1403
GC TRACE#: 140

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	8.41
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U

SAMPLE ANALYSES TRACES 119-145

p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: H2O BLANK
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 0
SAMPLE TYPE: H20 BLANK
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1423
GC TRACE#: 141

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-B-SG4
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1524
GC TRACE#: 143

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-B-SG5
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1606
GC TRACE#: 144

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-B-SG6
SAMPLE DATE: JUNE 22, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 22, 1994
ANALYSIS TIME: 1701
GC TRACE#: 145

ANALYTE	Conc µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U

p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 157-179

Method Detection Limits

Compound	Concentration µg/L
TRANS 1,2 DCE	34.00
BENZENE	4.00
CIS 1,2 DCE	23.00
TCE	4.00
PCE	4.70
TOLUENE	3.70
CHLORO/ETHYLBENZENE	8.20
p-XYLENE	6.80
o-XYLENE	5.60

SAMPLE ID: BC-B-SG7
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 818
GC TRACE#: 157

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	3.80	J
PCE	4.70	U
Toluene	33.14	R
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-B-SG8
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 837
GC TRACE#: 158

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	4.00	U
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-B-SG9
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 857
GC TRACE#: 159

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	4.00	U
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U

o-xylene	5.60	U

SAMPLE ID: BC-B-SG10
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 939
GC TRACE#: 160

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	0.43	J
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-B-SG11 DUP
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 1054
GC TRACE#: 162

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	2.05	J
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-B-SG11
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 1118
GC TRACE#: 163

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	4.00	U
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-B-SG12
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 1153
GC TRACE#: 164

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	4.00	U
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U

SAMPLE ANALYSES TRACES 157-179

o-xylene	5.60	U

SAMPLE ID: BC-B-SG13
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 1337
GC TRACE#: 167

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	5.84	
PCE	4.70	U
Toluene	1.79	J
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-B-SG14
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 1414
GC TRACE#: 168

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	35.40	
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-B-SG15
SAMPLE DATE: JUNE 23, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 23, 1994
ANALYSIS TIME: 1537
GC TRACE#: 179

ANALYTE	CONC µg/L	QUALIFIER
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	2.38	J
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ANALYSES TRACES 191-368

Method Detection Limits

Compound	Concentration µg/L
TRANS 1,2 DCE	34.00
BENZENE	4.00
CIS 1,2 DCE	23.00
TCE	4.00
PCE	4.70
TOLUENE	3.70
CHLORO/ETHYLBENZENE	8.20
p-XYLENE	6.80
o-XYLENE	5.60

SAMPLE ID: BC-C-SG1-A
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 922
GC TRACE#: 191

ANALYTE	CONC µg/L	Qualifier
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	4.00	U
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-C-SG1-B
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 10
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 941
GC TRACE#: 192

ANALYTE	CONC µg/L	
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	4.00	U
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U
o-xylene	5.60	U

SAMPLE ID: BC-C-SG1-C
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 20
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1009
GC TRACE#: 193

ANALYTE	CONC µg/L	
trans	34.00	U
benzene	4.00	U
cis	23.00	U
TCE	4.00	U
PCE	4.70	U
Toluene	3.70	U
chloro/ethyl	8.20	U
p-xylene	6.80	U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC-C-SG-2
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1125
GC TRACE#: 195

SAMPLE ID: BC-C-SG-3
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1216
GC TRACE#: 197

SAMPLE ID: BC-C-SG-4
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1240
GC TRACE#: 198

SAMPLE ID: BC-C-SG-5
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1440
GC TRACE#: 200

o-xylene	5.60 U

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U

o-xylene	5.60 U

SAMPLE ID: BC-C-SG-6
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1515
GC TRACE#: 201

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-7
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1601
GC TRACE#: 203

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-8
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1621
GC TRACE#: 204

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-9
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1649
GC TRACE#: 205

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U

SAMPLE ANALYSES TRACES 191-368

ANALYTE	CONC µg/L
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-10
SAMPLE DATE: JUNE 24, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 24, 1994
ANALYSIS TIME: 1709
GC TRACE#: 206

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-11
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 920
GC TRACE#: 211

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-12
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 946
GC TRACE#: 212

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-2
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1050
GC TRACE#: 215

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U

ANALYTE	CONC µg/L
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-3
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1110
GC TRACE#: 216

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-3 DUP
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1130
GC TRACE#: 217

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-4
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1150
GC TRACE#: 218

ANALYTE	CONC µg/L
trans	34.00 U
benzenebenze	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-6
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1347
GC TRACE#: 221

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	17.79
PCE	31.56
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U

SAMPLE ANALYSES TRACES 191-368

ANALYTE	CONC µg/L
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-5
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1406
GC TRACE#: 222

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-7
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1427
GC TRACE#: 223

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-8
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1446
GC TRACE#: 224

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-9
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1527
GC TRACE#: 226

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U

o-xylene	5.60 U

SAMPLE ID: BC-D-SG-10
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1617
GC TRACE#: 228

ANALYTE	CONC µg/L
trans	34.00 U
	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-11
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1637
GC TRACE#: 229

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-D-SG-12
SAMPLE DATE: JUNE 25, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 25, 1994
ANALYSIS TIME: 1657
GC TRACE#: 230

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-A-SG-2
SAMPLE DATE: JUNE 26, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 26, 1994
ANALYSIS TIME: 903
GC TRACE#: 235

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC-A-SG-3
SAMPLE DATE: JUNE 26, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 26, 1994
ANALYSIS TIME: 922
GC TRACE#: 236

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-A-SG-3 DUP
SAMPLE DATE: JUNE 26, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 26, 1994
ANALYSIS TIME: 947
GC TRACE#: 237

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-A-SG-4
SAMPLE DATE: JUNE 26, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 26, 1994
ANALYSIS TIME: 1026
GC TRACE#: 239

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-A-SG-5
SAMPLE DATE: JUNE 26, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 26, 1994
ANALYSIS TIME: 1124
GC TRACE#: 241

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

		ANALYTE	CONC µg/L
SAMPLE ID:	BC-A-SG-6	trans	34.00 U
SAMPLE DATE:	JUNE 26, 1994	benzene	4.00 U
SAMPLE DEPTH (Ft):	5	cis	23.00 U
SAMPLE TYPE:	SOIL GAS	TCE	4.00 U
ANALYSIS DATE:	JUNE 26, 1994	PCE	4.70 U
ANALYSIS TIME:	1143	Toluene	3.70 U
GC TRACE#:	242	chloro/ethyl	8.20 U
		p-xylene	6.80 U
		o-xylene	5.60 U

		ANALYTE	CONC µg/L
SAMPLE ID:	BC-A-SG-7	trans	34.00 U
SAMPLE DATE:	JUNE 26, 1994	benzene	4.00 U
SAMPLE DEPTH (Ft):	5	cis	23.00 U
SAMPLE TYPE:	SOIL GAS	TCE	4.00 U
ANALYSIS DATE:	JUNE 26, 1994	PCE	4.70 U
ANALYSIS TIME:	1226	Toluene	3.70 U
GC TRACE#:	244	chloro/ethyl	8.20 U
		p-xylene	6.80 U
		o-xylene	5.60 U

		ANALYTE	CONC µg/L
SAMPLE ID:	BC-E-SG-2	trans	34.00 U
SAMPLE DATE:	JUNE 26, 1994	benzene	4.00 U
SAMPLE DEPTH (Ft):	5	cis	23.00 U
SAMPLE TYPE:	SOIL GAS	TCE	4.00 U
ANALYSIS DATE:	JUNE 26, 1994	PCE	4.70 U
ANALYSIS TIME:	1339	Toluene	3.70 U
GC TRACE#:	245	chloro/ethyl	8.20 U
		p-xylene	6.80 U
		o-xylene	5.60 U

		ANALYTE	CONC µg/L
SAMPLE ID:	BC-E-SG-4	trans	34.00 U
SAMPLE DATE:	JUNE 26, 1994	benzene	4.00 U
SAMPLE DEPTH (Ft):	5	cis	23.00 U
SAMPLE TYPE:	SOIL GAS	TCE	6.39
ANALYSIS DATE:	JUNE 26, 1994	PCE	4.70 U
ANALYSIS TIME:	1437	Toluene	3.70 U
GC TRACE#:	246	chloro/ethyl	8.20 U
		p-xylene	6.80 U
		o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC-E-SG-3
SAMPLE DATE: JUNE 26, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 26, 1994
ANALYSIS TIME: 1458
GC TRACE#: 247

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-5
SAMPLE DATE: JUNE 26, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 26, 1994
ANALYSIS TIME: 1519
GC TRACE#: 248

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-6
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1020
GC TRACE#: 256

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-7
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1042
GC TRACE#: 257

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-7 DUP
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1100
GC TRACE#: 258

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-8
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1140
GC TRACE#: 260

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-9
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1220
GC TRACE#: 262

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-10
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1239
GC TRACE#: 263

ANALYTE	CONC µg/L
trans	34.00 U
	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC-E-SG-11
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1257
GC TRACE#: 264

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	1.28 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-12
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1410
GC TRACE#: 267

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-13
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1432
GC TRACE#: 268

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	16.56
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-14
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1451
GC TRACE#: 269

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	16.70
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-15
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1531
GC TRACE#: 271

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-16
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1557
GC TRACE#: 272

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-17
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1618
GC TRACE#: 273

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	1.38 J
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-E-SG-18
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1712
GC TRACE#: 274

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	37.28
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC-E-SG-18 DUP
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1731
GC TRACE#: 275

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-A-SG-8
SAMPLE DATE: JUNE 27, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 27, 1994
ANALYSIS TIME: 1756
GC TRACE#: 276

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-13
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 826
GC TRACE#: 280

ANALYTE	CONC µg/L
trans	34.00 U
	4.00 U
cis	23.00 U
TCE	4.85
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-14
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 846
GC TRACE#: 281

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC-C-SG-15A
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 1034
GC TRACE#: 284

ANALYTE	CONC µg/L
trans	34.00 U
	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-15B
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 15
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 1053
GC TRACE#: 285

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-16
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 1140
GC TRACE#: 287

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-17
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 1201
GC TRACE#: 288

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-18
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 1220
GC TRACE#: 289

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-19
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 1521
GC TRACE#: 294

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-19 DUP
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 1541
GC TRACE#: 295

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-C-SG-20
SAMPLE DATE: JUNE 28, 1994
SAMPLE DEPTH (Ft): 5
SAMPLE TYPE: SOIL GAS
ANALYSIS DATE: JUNE 28, 1994
ANALYSIS TIME: 1638
GC TRACE#: 298

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

		ANALYTE	CONC µg/L
SAMPLE ID:	BC-E-SG-19	trans	34.00 U
SAMPLE DATE:	JUNE 29, 1994	benzene	4.00 U
SAMPLE DEPTH (Ft):	5	cis	23.00 U
SAMPLE TYPE:	SOIL GAS	TCE	4.00 U
ANALYSIS DATE:	JUNE 29, 1994	PCE	4.70 U
ANALYSIS TIME:	910	Toluene	3.70 U
GC TRACE#:	303	chloro/ethyl	8.20 U
		p-xylene	6.80 U
		o-xylene	5.60 U

		ANALYTE	CONC µg/L
SAMPLE ID:	BC-F-B1-0103		
SAMPLE DATE:	JUNE 29, 1994	trans	34.00 U
SAMPLE DEPTH (Ft):	1-3	benzene	4.00 U
SAMPLE TYPE:	SOIL	cis	23.00 U
ANALYSIS DATE:	JUNE 29, 1994	TCE	4.00 U
ANALYSIS TIME:	1215	PCE	4.70 U
GC TRACE#:	304	Toluene	3.70 U
		chloro/ethyl	8.20 U
		p-xylene	6.80 U
		o-xylene	5.60 U

		ANALYTE	CONC µg/L
SAMPLE ID:	BC-F-B1-0507		
SAMPLE DATE:	JUNE 29, 1994	trans	34.00 U
SAMPLE DEPTH (Ft):	5-7	benzene	4.00 U
SAMPLE TYPE:	SOIL	cis	23.00 U
ANALYSIS DATE:	JUNE 29, 1994	TCE	4.00 U
ANALYSIS TIME:	1235	PCE	4.70 U
GC TRACE#:	305	Toluene	3.70 U
		chloro/ethyl	8.20 U
		p-xylene	6.80 U
		o-xylene	5.60 U

		ANALYTE	CONC µg/L
SAMPLE ID:	BC-F-B1-1012		
SAMPLE DATE:	JUNE 29, 1994	trans	34.00 U
SAMPLE DEPTH (Ft):	10-12	benzene	4.00 U
SAMPLE TYPE:	SOIL	cis	23.00 U
ANALYSIS DATE:	JUNE 29, 1994	TCE	4.00 U
ANALYSIS TIME:	1339	PCE	4.70 U
GC TRACE#:	307	Toluene	3.70 U
		chloro/ethyl	8.20 U
		p-xylene	6.80 U
		o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC-F-B1-1517
SAMPLE DATE: JUNE 29, 1994
SAMPLE DEPTH (Ft): 15-17
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 29, 1994
ANALYSIS TIME: 1358
GC TRACE#: 308

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-F-B1-2022
SAMPLE DATE: JUNE 29, 1994
SAMPLE DEPTH (Ft): 20-22
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 29, 1994
ANALYSIS TIME: 1418
GC TRACE#: 309

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-F-B1-2527
SAMPLE DATE: JUNE 29, 1994
SAMPLE DEPTH (Ft): 25-27
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 29, 1994
ANALYSIS TIME: 1440
GC TRACE#: 310

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-F-B1-3032
SAMPLE DATE: JUNE 29, 1994
SAMPLE DEPTH (Ft): 30-32
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 29, 1994
ANALYSIS TIME: 1440
GC TRACE#: 311

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC-F-B1-3537
SAMPLE DATE: JUNE 29, 1994
SAMPLE DEPTH (Ft): 35-37
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 29, 1994
ANALYSIS TIME: 1606
GC TRACE#: 313

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-F-B2-0103
SAMPLE DATE: JUNE 29, 1994
SAMPLE DEPTH (Ft): 1-3
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 29, 1994
ANALYSIS TIME: 1643
GC TRACE#: 314

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-F-B2-0507
SAMPLE DATE: JUNE 29, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 29, 1994
ANALYSIS TIME: 1703
GC TRACE#: 315

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-F-B2-1012
SAMPLE DATE: JUNE 30, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 30, 1994
ANALYSIS TIME: 823
GC TRACE#: 320

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC-F-B2-1517
SAMPLE DATE: JUNE 30, 1994
SAMPLE DEPTH (Ft): 15-17
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 30, 1994
ANALYSIS TIME: 842
GC TRACE#: 321

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-F-B2-2022
SAMPLE DATE: JUNE 30, 1994
SAMPLE DEPTH (Ft): 20-22
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 30, 1994
ANALYSIS TIME: 901
GC TRACE#: 322

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-F-B2-2527
SAMPLE DATE: JUNE 30, 1994
SAMPLE DEPTH (Ft): 25-27
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 30, 1994
ANALYSIS TIME: 920
GC TRACE#: 323

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC-F-B2-3032
SAMPLE DATE: JUNE 30, 1994
SAMPLE DEPTH (Ft): 30-32
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 30, 1994
ANALYSIS TIME: 940
GC TRACE#: 324

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

AMPLE ANALYSES TRACES 191-368

SAMPLE ID:	BC A B1 0507
SAMPLE DATE:	JUNE 30, 1994
SAMPLE DEPTH (Ft):	5-7
SAMPLE TYPE:	SOIL
ANALYSIS DATE:	JUNE 30, 1994
ANALYSIS TIME:	1101
GC TRACE#:	328

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID:	BC A B1 1012
SAMPLE DATE:	JUNE 30, 1994
SAMPLE DEPTH (Ft):	10-12
SAMPLE TYPE:	SOIL
ANALYSIS DATE:	JUNE 30, 1994
ANALYSIS TIME:	1042
GC TRACE#:	327

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID:	BC A B1 1517
SAMPLE DATE:	JUNE 30, 1994
SAMPLE DEPTH (Ft):	15-17
SAMPLE TYPE:	SOIL
ANALYSIS DATE:	JUNE 30, 1994
ANALYSIS TIME:	1120
GC TRACE#:	329

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID:	BC A B1 2022
SAMPLE DATE:	JUNE 30, 1994
SAMPLE DEPTH (Ft):	20-22
SAMPLE TYPE:	SOIL
ANALYSIS DATE:	JUNE 30, 1994
ANALYSIS TIME:	1139
GC TRACE#:	330

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 191-368

SAMPLE ID: BC A B1 2527
SAMPLE DATE: JUNE 30, 1994
SAMPLE DEPTH (Ft): 25-27
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 30, 1994
ANALYSIS TIME: 1200
GC TRACE#: 331

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ID: BC A B1 0001
SAMPLE DATE: JUNE 30, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JUNE 30, 1994
ANALYSIS TIME: 1326
GC TRACE#: 333

ANALYTE	CONC µg/L
trans	34.00 U
benzene	4.00 U
cis	23.00 U
TCE	4.00 U
PCE	4.70 U
Toluene	3.70 U
chloro/ethyl	8.20 U
p-xylene	6.80 U
o-xylene	5.60 U

SAMPLE ANALYSES TRACES 369-500
Method Detection Limits

Compound	Concentration µg/L
TRANS 1,2 DCE	34
BENZENE	4
CIS 1,2 DCE	23
TCE	4
PCE	4.7
TOLUENE	3.7
CHLORO/ETHYLBENZENE	8.2
p-XYLENE	6.8
o-XYLENE	5.6

SAMPLE ID: BC F-B3-0103
SAMPLE DATE: JULY 11, 1994
SAMPLE DEPTH (Ft): 1-3
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 11, 1994
ANALYSIS TIME: 1705
GC TRACE#: 369

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC F-B3-0507
SAMPLE DATE: JULY 11, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 11, 1994
ANALYSIS TIME: 1720
GC TRACE#: 370

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC F-B3-1012
SAMPLE DATE: JULY 11, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 11, 1994
ANALYSIS TIME: 1735
GC TRACE#: 371

SAMPLE ANALYSES TRACES 369-500

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC F-B3-1517
SAMPLE DATE: JULY 11, 1994
SAMPLE DEPTH (Ft): 15-17
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 11, 1994
ANALYSIS TIME: 1749
GC TRACE#: 372

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC F-B3-2022
SAMPLE DATE: JULY 11, 1994
SAMPLE DEPTH (Ft): 20-22
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 11, 1994
ANALYSIS TIME: 1804
GC TRACE#: 373

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC F-B3-2527
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 25-27
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 845
GC TRACE#: 379

Concentration µg/L Qualifier

TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC F-B3-3032
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 30-32
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 900
GC TRACE#: 380

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-A-B2-0507
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1047
GC TRACE#: 382

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-A-B2-1012
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1103
GC TRACE#: 383

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U

SAMPLE ANALYSES TRACES 369-500

BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-A-B2-1517
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 15-17
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1119
GC TRACE#: 384

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-A-B2-2022
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 20-22
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1134
GC TRACE#: 385

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-A-B2-2527
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 25-27
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1214
GC TRACE#: 388

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U

CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-A-B2-3032
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 30-32
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1233
GC TRACE#: 389

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B1-0507
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1626
GC TRACE#: 391

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B1-1012
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1642
GC TRACE#: 392

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U

SAMPLE ANALYSES TRACES 369-500

TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B1-1517
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 15-17
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1702
GC TRACE#: 393

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B1-2022
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 20-22
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1717
GC TRACE#: 394

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B1-2527
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 25-27
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1756
GC TRACE#: 397

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U

PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B1-3032
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 30-32
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1812
GC TRACE#: 398

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B2-0001
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 2031
GC TRACE#: 404

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B2-0507
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 1945
GC TRACE#: 401

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U

SAMPLE ANALYSES TRACES 369-500

TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B2-1012
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 2016
GC TRACE#: 403

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B2-1517
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 15-17
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 2045
GC TRACE#: 405

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B2-2022
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 20-22
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 12, 1994
ANALYSIS TIME: 2001
GC TRACE#: 402

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U

CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-E-B2-3032
SAMPLE DATE: JULY 12, 1994
SAMPLE DEPTH (Ft): 30-32
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 901
GC TRACE#: 413

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B2-0002
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1003
GC TRACE#: 418

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B2-0507
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 931
GC TRACE#: 415

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U

p-XYLENE	6.8 U
o-XYLENE	5.6 U

SAMPLE ID: BC-B-B2-1012
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 916
GC TRACE#: 414

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B2-1517
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 15-17
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1018
GC TRACE#: 419

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B2-2022
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 20-22
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1033
GC TRACE#: 420

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U

o-XYLENE	5.6	U

SAMPLE ID: BC-B-B2-2527
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 25-27
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1050
GC TRACE#: 421

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B3-0002
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1129
GC TRACE#: 424

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B3-0507
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1144
GC TRACE#: 425

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ANALYSES TRACES 369-500

SAMPLE ID: BC-B-B3-1012
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1159
GC TRACE#: 426

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B4-0002
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1215
GC TRACE#: 427

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B4-0507
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1231
GC TRACE#: 428

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B4-1012
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1246
GC TRACE#: 429

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BLANK
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 0
SAMPLE TYPE:
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1301
GC TRACE#: 430

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BLANK
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 0
SAMPLE TYPE:
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1322
GC TRACE#: 431

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B1-0002

SAMPLE ANALYSES TRACES 369-500

SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1436
GC TRACE#: 434

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B1-0507
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1451
GC TRACE#: 435

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B1-1012
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1506
GC TRACE#: 436

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B1-1517
SAMPLE DATE: JULY 13, 1994

SAMPLE DEPTH (Ft): 15-17
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1522
GC TRACE#: 437

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B1-2022
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 20-22
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1540
GC TRACE#: 438

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-B-B1-2527
SAMPLE DATE: JULY 13, 1994
SAMPLE DEPTH (Ft): 25-27
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 13, 1994
ANALYSIS TIME: 1601
GC TRACE#: 439

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B1-OOO2
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 0-2

SAMPLE ANALYSES TRACES 369-500

SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 14, 1994
ANALYSIS TIME: 1404
GC TRACE#: 447

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B1-0507
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 14, 1994
ANALYSIS TIME: 1419
GC TRACE#: 448

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B1-1012
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 14, 1994
ANALYSIS TIME: 1434
GC TRACE#: 449

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B1-1517
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 15-17

SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 14, 1994
ANALYSIS TIME: 1517
GC TRACE#: 452

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B2-0002
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 14, 1994
ANALYSIS TIME: 1551
GC TRACE#: 453

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B2-0507
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 14, 1994
ANALYSIS TIME: 1606
GC TRACE#: 454

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B2-1012
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL

SAMPLE ANALYSES TRACES 369-500

ANALYSIS DATE: JULY 14, 1994
ANALYSIS TIME: 1622
GC TRACE#: 455

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	E
BENZENE	4	E
CIS 1,2 DCE	23	E
TCE	4	E
PCE	4.7	E
TOLUENE	3.7	E
CHLORO/ETHYLBENZENE	8.2	E
p-XYLENE	6.8	E
o-XYLENE	5.6	E

SAMPLE ID: BC-C-B3-0002
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 14, 1994
ANALYSIS TIME: 1712
GC TRACE#: 456

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B3-0507
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 14, 1994
ANALYSIS TIME: 1739
GC TRACE#: 457

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: H2O BLANK
SAMPLE DATE: JULY 14, 1994
SAMPLE DEPTH (Ft): 0
SAMPLE TYPE: H2O BLANK
ANALYSIS DATE: JULY 14, 1994

SAMPLE ANALYSES TRACES 369-500

ANALYSIS TIME: 1814
GC TRACE#: 458

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B3-1012
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 920
GC TRACE#: 466

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B3-1416
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 14-16
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 935
GC TRACE#: 467

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B4-0002
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15,1994
ANALYSIS TIME: 1230

SAMPLE ANALYSES TRACES 369-500

GC TRACE#: 479

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B4-0507
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 950
GC TRACE#: 468

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B4-1012
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1006
GC TRACE#: 469

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B4-1012DUP
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1025
GC TRACE#: 470

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-D-B1-0002
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1215
GC TRACE#: 478

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-D-B1-0507
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1039
GC TRACE#: 471

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-D-B1-1012*
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: NA NO RECOVERY
ANALYSIS TIME: NA
GC TRACE#: NA

SAMPLE ANALYSES TRACES 369-500

SAMPLE ID: BC-D-B1-1517
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 15-17
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1130
GC TRACE#: 475

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-D-B1-2022
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 20-22
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1145
GC TRACE#: 476

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-D-B1-2527
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 25-27
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1200
GC TRACE#: 477

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-D-B2-0002

SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1305
GC TRACE#: 481

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-D-B2-0507
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1250
GC TRACE#: 480

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B3-0002
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 0-2
SAMPLE TYPE: SOIL (Second analysis of sample
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1517
GC TRACE#: 484

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B3-0507
SAMPLE DATE: JULY 15, 1994

SAMPLE ANALYSES TRACES 369-500

SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL (Second analysis of sample
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1532
GC TRACE#: 485

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B5-0507
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1609
GC TRACE#: 486

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B5-1012
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 10-12
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1629
GC TRACE#: 487

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B6-0507
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 5-7

SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1640
GC TRACE#: 488

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B6-1012
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1700
GC TRACE#: 489

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-B7-0507
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 5-7
SAMPLE TYPE: SOIL
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1714
GC TRACE#: 490

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-W-5
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 12
SAMPLE TYPE: H2O

SAMPLE ANALYSES TRACES 369-500

ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1811
GC TRACE#: 491

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-W-6
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 12
SAMPLE TYPE: H2O
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1826
GC TRACE#: 492

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

SAMPLE ID: BC-C-W-7
SAMPLE DATE: JULY 15, 1994
SAMPLE DEPTH (Ft): 12
SAMPLE TYPE: H2O
ANALYSIS DATE: JULY 15, 1994
ANALYSIS TIME: 1846
GC TRACE#: 493

	Concentration µg/L	Qualifier
TRANS 1,2 DCE	34	U
BENZENE	4	U
CIS 1,2 DCE	23	U
TCE	4	U
PCE	4.7	U
TOLUENE	3.7	U
CHLORO/ETHYLBENZENE	8.2	U
p-XYLENE	6.8	U
o-XYLENE	5.6	U

DATA QUALIFIERS
(HAZWRAP)

Qualifier	Definition	Indicates: Uncertain Identity?	Uncertain Concentration?
Inorganic and Organic Data			
U	The material was analyzed for, but not detected. The associated numerical value is the MDL.	Yes	Yes
J	The associated numerical value is an estimated quantity	No	Yes
R	Quality control indicates that the data are unusable (compound may or may not be present). Re-sampling and/or re-analysis is necessary for verification.	Yes	Yes
Z	No analytical results (inorganic data only).	NA	NA
Q	No analytical result (organic data only).	NA	NA
N	Presumptive evidence of presence of material (tentative identification).	Yes	Yes
E	Analytical result exceeded calibration	Yes	Yes

APPENDIX B: FIELD CHANGE REQUESTS

The Earth Technology Corporation

Field change No. 5
Page 1 of 1

Figure 2-11. Field Change Request

Project name	110th FG MIANG, BATTLE CREEK, MI	Project Number	948901-05
Applicable Document	FINAL PA/SI WORK PLAN	Date	March 1994

Description: Reduce soil boring and laboratory sample numbers
see attached

Minor change ☒ Major change ☐ Major project impact ☐

Requested by: Jack Briegel

Reason for change: Preliminary soil gas results do not justify planned soil boring and sample #'s proposed in workplan

Recommended disposition:
approve as recommended

Impact on present and completed work:
no significant impact

Accepted ☒ Rejected ☐ Signature J S Briegel Date 6/29/94
Project Manager

Accepted ☐ Rejected ☐ Signature ______ Date ______
Project QA/QC Officer

(Required prior to implemenation of major changes)

Accepted ☐ Rejected ☐ Signature ______ Date ______
Program Manager

Accepted ☐ Rejected ☐ Signature ______ Date ______
Program QA/QC Officer

(Required prior to implementation of changes with major project impact)

Approved ☐ Rejected ☐ Signature ______ Date ______
CLIENT Project Manager

Final Disposition ______

Signature ______ Date ______

Form3E-1
6/30/89

6/29/94

Field change #5

(a). Recommend for each boring at AOCs A, D, E to select only the surface sample and the soil sample just above the water table for laboratory analysis. The third proposed sample should be considered optional and should only be sent to the laboratory if field screening results indicate VOCs exist in the soils.

(b) All borings at AOCs B, C and F should be sampled according to the work plan

(c). Boring numbers should be reduced as follows:

AOC A: From 3 (proposed) to 2

AOC B: no change

AOC C: no change at this time

AOC D: From 3 (proposed) to 2

AOC E: From 3 (proposed) to 2

AOC F: no change

(d) Immunoassay screening for PAHs on AOC C soil borings should be initiated.

The Earth Technology Corporation

Field change No. 6
Page 1 of 1

Figure 2-11. Field Change Request

Project name 110th FG, MIANG Battle Creek Project Number 948901-05
Applicable Document Final PA/SI Work Plan Date 6/29/94

Description: Change requirement for ASTM Type II water in decon process to ASTM Type I water

Minor change [X] Major change [ ] Major project impact [ ]

Requested by: Jack Briegel

Reason for change: ~~Verbal~~ Discussions with HAZWRAP personnel have indicated this is an acceptable alternative.

Recommended disposition: approve as recommended

Impact on present and completed work: none

Accepted [✓] Rejected [ ] Signature [signature] Date 6/29/94
Project Manager

Accepted [ ] Rejected [ ] Signature ______ Date ______
Project QA/QC Officer

(Required prior to implemenation of major changes)

Accepted [ ] Rejected [ ] Signature ______ Date ______
Program Manager

Accepted [ ] Rejected [ ] Signature ______ Date ______
Program QA/QC Officer

(Required prior to implementation of changes with major project impact)

Approved [ ] Rejected [ ] Signature ______ Date ______
CLIENT Project Manager

Final Disposition ______

Signature ______ Date ______

Form3E-1
6/30/89

The Earth Technology Corporation

Field change No. 7
Page 1 of 1

Figure 2-11. Field Change Request

Project name 110th FG, MIANG Battle Creek MI Project Number 948901-05

Applicable Document Final PA/SI Work Plan Date 6/29/94

Description: Change soil sample handling procedures as described on attached.

Minor change [X] Major change [ ] Major project impact [ ]

Requested by: Jack Briegel

Reason for change: current proposed process will not allow the onsite geologist to accurately describe the soils

Recommended disposition: approve as recommended

Impact on present and completed work: none.

Accepted [X] Rejected [ ] Signature J. Briegel Date 6/29/94
Project Manager

Accepted [ ] Rejected [ ] Signature ______ Date ______
Project QA/QC Officer

(Required prior to implemenation of major changes)

Accepted [ ] Rejected [ ] Signature ______ Date ______
Program Manager

Accepted [ ] Rejected [ ] Signature ______ Date ______
Program QA/QC Officer

(Required prior to implementation of changes with major project impact)

Approved [ ] Rejected [ ] Signature ______ Date ______
CLIENT Project Manager

Final Disposition ______

Signature ______ Date ______

Form3E-1
6/30/89

6/29/94

Field Change 7

Soil handling procedures

(a) The Geoprobe drives piston-type core barrels lined with stainless steel sleeves. The capacity of the barrels is 320 ml (~ 11 ozs). If full recovery is obtained the laboratory will require 3 liners (at a minimum). and the field lab will require ± 5 grams of soil. If the liners are all capped and delivered to the labs the onsite geologist will not have an opportunity to describe the core.

(b) Its recommended to cap only one of the liners (for VOC analysis). The remaining liners will be emptied, ~~into a~~ logged and placed in 4-oz soil jars for shipment to the field and fixed base (SVOC and metals) analysis.

APPENDIX C: INVESTIGATION-DERIVED WASTE RESULTS

631 Emory Valley Road, Oak Ridge, Tennessee 37830

Telephone
615.483.9404
Facsimile
615.481.383-

August 23, 1994

Captain Fred Vollmerhausen
Environmental Coordinator
110th Fighter Group, Michigan Air National Guard
3545 Mustang Avenue
Battle Creek, Michigan 49015-5509

Dear Captain Vollmerhausen:

Field sampling activities at the 110th Fighter Group were ongoing from the middle of May to the middle of July, 1994. Approximately 400 to 450 gallons of wastewater generated by purging monitoring wells and decontaminating sampling equipment was containerized in polyethylene tanks and left on site. A composite sample of this wastewater was collected and analyzed for priority pollutant list volatile and semivolatile organic compounds, pesticides, PCBs, and metals (EPA methods 608, 624, and 625) in the WWES Laboratory, Grand Rapids, Michigan. The final report has been mailed to our office and, once received, will be provided to you in a more official version.

Please contact me if you have any questions or comments regarding these matters.

Sincerely,

EARTH TECH
Government Services Division

Jack S Briegel

Jack S. Briegel
Project Manager

cc: Mr. Dan Wyatt, ANGRC (1 Copy)
Mr. Tom Cady, HAZWRAP (1 Copy)

File copy K-20 (HAZWRAP)

DWODK20 6

5555 Glenwood Hills Parkway, SE, Post Office Box 874, Grand Rapids, Michigan 49588-0874

See: K-20 HALWRAP
IDW (Investigation Derived
Waste)

August 22, 1994

EARTH TECH - OAK RIDGE
Attn: Jack Briegel
EARTH TECH
683 EMORY VALLEY ROAD
OAK RIDGE, TN 37830

Telephone
616.942.9600
Facsimile
616.942.6499

RE: 110th Fighter Group
MICH A.N.G.

Dear Mr. Jack Briegel:

Enclosed are two copies of your laboratory report and one copy of your invoice for project number 32429. This submittal was completely received on July 28, 1994. All analyses have been validated and comply with our Quality Control program statistics unless otherwise noted.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Gregory K. Reed

Gregory K. Reed
Project Chemist

Enclosure

EARTH TECH

Formerly WW Engineering & Science

ANALYTICAL REPORT

EARTH TECH - OAK RIDGE
Proj: 110th Fighter Group
MICH A.N.G.
Subm: 27-JULY-1994 Sampling

Submittal Number: 32429- 1
Location:
CCS Number .00
CCS Manager: Jack Briegel

	Purge Well	Reporting Limit	Units
Lab Sample No:	93376		
Project Specific Fraction USEPA 624	Enclosed		
Project Specific Fraction USEPA 625	* Enclosed		
Organochlorine Pesticides USEPA METHOD 608	* Enclosed		
Organochlorine Pesticides USEPA Method 608	* Enclosed		
Arsenic, Total	8.6	1.0	ug/l
Cadmium, Total	2.2	0.2	ug/l
Chromium, Total	<50	50	ug/l
Copper, Total	42	10	ug/l
Lead, Total	<1.0	1.0	ug/l
Mercury, Total	<0.2	0.2	ug/l
Nickel, Total	570	10	ug/l
Selenium, Total	<2.0	2.0	ug/l
Silver, Total	<0.2	0.2	ug/l
Zinc, Total	210	20	ug/l
Antimony, Total	<2.0	2.0	ug/l
Thallium, Total	<2.0	2.0	ug/l
Beryllium, Total	<10	10	ug/l

Sampled by: M.C.
Date Sampled: 07/27/94
Time Sampled: 11:00
Date Received: 07/27/94
Time Received: 15:40

* See attached Statement of Data Qualifications.

5555 Glenwood Hills Parkway SE, PO Box 874, Grand Rapids, MI 49588-0874, 616/942-9600 Fax 942-6499

PROJECT SPECIFIC FRACTION
USEPA 624

EARTH TECH - OAK RIDGE
Proj: 110th Fighter Group
MICH A.N.G.
Subm: 27-JULY-1994 Sampling
Sample: Purge Well

Submittal Number 32429- 1
Date Sampled: 07/27/94 Time: 11:00
Date Received: 07/27/94 Time: 15:40
Analysis Date: 08/03/94
Lab Sample No: 93376

Parameter	Result ug/l
1,1,1-Trichloroethane	<1.0
1,1,2,2-Tetrachloroethane	<1.0
1,1,2-Trichloroethane	<1.0
1,1-Dichloroethane	<1.0
1,1-Dichloroethylene	<1.0
1,2-Dichloroethylene-(total)	<1.0
1,2-Dichloroethane	<1.0
1,2-Dichloropropane	<1.0
2-Chloroethyl Vinyl Ether	<10
Benzene	**1.4**
Bromodichloromethane	<1.0
Bromoform	<1.0
Bromomethane	<1.0
Carbon Tetrachloride	<1.0
Chlorobenzene	**1.1**
Chloroethane	<1.0
Chloroform	<1.0
Chloromethane	<1.0
cis-1,3-Dichloropropene	<1.0
Dibromochloromethane	<1.0
Ethylbenzene	**1.1**
Methylene Chloride	<1.0
Tetrachloroethene	<1.0
Toluene	**1.5**
trans-1,3-Dichloropropene	<1.0
Vinyl Chloride	<1.0
Xylene, Total	<3.0
Trichloroethene	<1.0
Acrolein	<15
Acrylonitrile	<1.0
Dichlorodifluoromethane	<10
Trichlorofluoromethane	<1.0

5555 Glenwood Hills Parkway SE, PO Box 874, Grand Rapids, MI 49588-0874, 616/942-9600 Fax 9

PROJECT SPECIFIC FRACTION
USEPA 625

EARTH TECH - OAK RIDGE	Submittal Number 32429- 1
Proj: 110th Fighter Group	Date Sampled: 07/27/94 Time: 11:
MICH A.N.G.	Date Received: 07/27/94 Time: 15:
Subm: 27-JULY-1994 Sampling	Analysis Date: 08/04/94
Sample: Purge Well	Lab Sample No: 93376

Parameter	Result ug/l	Parameter	Result ug/l
1,2,4-Trichlorobenzene	<5.0	Di-n-Butylphthalate	<5.0
2,4,5-Trichlorophenol	<5.0	Di-n-Octylphthalate	<5.0
2,4,6-Trichlorophenol	<5.0	Dibenzo (a,h) Anthracene	<5.0
2,4-Dichlorophenol	<5.0	Dimethylphthalate	<5.0
2,4-Dimethylphenol	<5.0	Diethylphthalate	10
2,4-Dinitrophenol	<20	Fluoranthene	<5.0
2,4-Dinitrotoluene	<5.0	Fluorene	<5.0
2,6-Dinitrotoluene	<5.0	Hexachlorobenzene	<5.0
2-Chloronaphthalene	<5.0	Hexachlorobutadiene	<5.0
2-Chlorophenol	<5.0	Hexachlorocyclopentadiene	<5.0
2-Methylnaphthalene	<5.0	Hexachloroethane	<5.0
2-Methylphenol	<5.0	Isophorone	<5.0
2-Nitrophenol	<5.0	Indeno (1,2,3-cd) Pyrene	<5.0
4-Bromophenyl Phenylether	<5.0	N-Nitrosodi-n-Propylamine	<5.0
4,6-Dinitro-2-Methylphenol	<20	N-Nitroso-di-Phenylamine	6.0
4-Chloro-3-Methylphenol	<5.0	Naphthalene	<5.0
4-Chlorophenylphenyl-Ether	<5.0	Pentachlorophenol	<50
4-Methylphenol	<5.0	Phenanthrene	<5.0
4-Nitrophenol	<20	Phenol	<5.0
Acenaphthene	<5.0	Pyrene	<5.0
Acenaphthylene	<5.0	1,2-Dichlorobenzene	<5.0
Anthracene	<5.0	1,3-Dichlorobenzene	<5.0
Benzo (a) Anthracene	<5.0	1,4-Dichlorobenzene	<5.0
Benzo (a) Pyrene	<5.0	3,3'-Dichlorobenzidine	<20
Benzo (b&k) Fluoranthene	<5.0	4-Chloroaniline	<20
Benzo (g,h,i,) Perylene	<5.0	Dibenzofuran	<5.0
Benzoic Acid	<50	2-Nitroaniline	<20
Benzyl Alcohol	<50	3-Nitroaniline	<20
Bis (2-Chloroisopropyl)-Ether	<5.0	4-Nitroaniline	<20
Bis (2-Chloroethyl) Ether	<5.0	Nitrobenzene	<5.0
Bis (2-ethylhexyl)-Phthalate	12	Benzidine	<50

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PROJECT SPECIFIC FRACTION
USEPA 625

EARTH TECH - OAK RIDGE
Proj: 110th Fighter Group
MICH A.N.G.
Subm: 27-JULY-1994 Sampling
Sample: Purge Well

Submittal Number 32429- 1
Date Sampled: 07/27/94 Time: 11:00
Date Received: 07/27/94 Time: 15:40
Analysis Date: 08/04/94
Lab Sample No: 93376

Parameter	Result ug/l	Parameter	Result ug/l
Bis (2-Chloroethoxy)-Methane	<5.0	1,2-Diphenylhydrazine	<5.0
Butyl Benzyl Phthalate	<5.0	N-Nitroso-di-methylamine	<10
Chrysene	<5.0		

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ORGANOCHLORINE PESTICIDES
USEPA METHOD 608

EARTH TECH - OAK RIDGE
Proj: 110th Fighter Group
MICH A.N.G.
Subm: 27-JULY-1994 Sampling
Sample: Purge Well

Submittal Number 32429- 1
Date Sampled: 07/27/94 Time: 11:00
Date Received: 07/27/94 Time: 15:40
Analysis Date: 08/18/94
Lab Sample No: 93376

Parameter	Result ug/l	Parameter	Result ug/l
Aldrin	<1.0	Dieldrin	<1.0
Alpha-BHC	<1.0	Endosulfan I	<1.0
Beta-BHC	<1.0	Endosulfan II	<1.0
Delta-BHC	<1.0	Endosulfan Sulfate	<1.0
Lindane	<1.0	Endrin	<1.0
4,4'-DDD	<1.0	Endrin Aldehyde	<1.0
4,4'-DDE	<1.0	Heptachlor	<1.0
4,4'-DDT	<1.0	Heptachlor Epoxide	<1.0

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ORGANOCHLORINE PESTICIDES
USEPA METHOD 608

EARTH TECH - OAK RIDGE
Proj: 110th Fighter Group
MICH A.N.G.
Subm: 27-JULY-1994 Sampling
Sample: Purge Well

Submittal Number 32429- 1
Date Sampled: 07/27/94 Time: 11:00
Date Received: 07/27/94 Time: 15:40
Analysis Date: 08/02/94
Lab Sample No: 93376

Parameter	Result ug/l	Parameter	Result ug/l
Chlordane (technical)	<1.0	PCB-1242	<1.0
Toxaphene	<1.0	PCB-1248	<1.0
PCB-1016	<1.0	PCB-1254	<1.0
PCB-1221	<1.0	PCB-1260	<1.0
PCB-1232	<1.0		

Page 6 - **End of Analytical Report**

METHODS PAGE

Parameter: Project Specific Fraction USEPA 624
Method: Volatiles Purge & Trap-GC/MS
Application: WW
Analyst: Phuong K. Tran
Reference Citation: USEPA-624
Date Analyzed: 08/03/94

93376 Purge Well

Parameter: Project Specific Fraction USEPA 625
Method: Semi-Volatiles GC/MS
Application: WW
Analyst: Scott Borgeson
Reference Citation: USEPA-625
Date Analyzed: 08/04/94

93376 Purge Well

Parameter: Antimony, Total
Method: Atomic Absorption-Furnace, Antimony
Application: WW
Analyst: Diane L. VanMale
Reference Citation: USEPA-204.2
Date Analyzed: 08/01/94

93376 Purge Well

Parameter: Arsenic, Total
Method: Atomic Absorption-Furnace, Arsenic
Application: WW
Analyst: Rebecca A. McColgan
Reference Citation: USEPA-206.2
Date Analyzed: 08/02/94

93376 Purge Well

Parameter: Beryllium, Total
Method: Atomic Emission-ICP
Application: WW
Analyst: J.T. Whitmore
Reference Citation: EPA-200.7/6010
Date Analyzed: 08/06/94

93376 Purge Well

Parameter: Cadmium, Total
Method: Atomic Absorption-Furnace, Cadmium
Application: WW
Analyst: Rebecca A. McColgan
Reference Citation: USEPA-213.2
Date Analyzed: 08/01/94

93376 Purge Well

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METHODS PAGE

Parameter: Chromium, Total
Method: Atomic Emission-ICP
Application: WW
Analyst: J.T. Whitmore
Reference Citation: EPA-200.7/6010
Date Analyzed: 08/06/94

93376 Purge Well

Parameter: Copper, Total
Method: Atomic Emission-ICP
Application: WW
Analyst: J.T. Whitmore
Reference Citation: EPA-200.7/6010
Date Analyzed: 08/06/94

93376 Purge Well

Parameter: Semi-Volatile Extraction
Method: Separatory Funnel Liquid-Liquid Extract.
Application: WW
Analyst: Scott S. Hetrick
Reference Citation: USEPA-3510
Date Analyzed: 08/02/94

93376 Purge Well

Parameter: PCB Pesticide Extraction
Method: Separatory Funnel Liquid-Liquid Extract.
Application: WW
Analyst: Kari L. Zeller
Reference Citation: USEPA-3510
Date Analyzed: 07/31/94

93376 Purge Well

Parameter: Lead, Total
Method: Atomic Absorption-Furnace, Lead
Application: WW
Analyst: Rebecca A. McColgan
Reference Citation: USEPA-239.2
Date Analyzed: 08/02/94

93376 Purge Well

Parameter: Mercury, Total
Method: Manual Cold Vapor, Mercury
Application: WW
Analyst: David W. Johnson
Reference Citation: USEPA-245.1
Date Analyzed: 08/01/94

93376 Purge Well

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METHODS PAGE

Parameter: Digestion Method-3005 Furnace-AA (Wastewater)
Method: Acid Digestion for Furnace-AA
Application: WW Reference Citation: USEPA-3005
Analyst: Linda A. Harrison Date Analyzed: 07/29/94

93376 Purge Well

Parameter: Metals Pretreatment- Arsenic and/or Selenium
Method: Digestion for Furnace As/Se
Application: WW Reference Citation: USEPA Methods
Analyst: Linda A. Harrison Date Analyzed: 07/29/94

93376 Purge Well

Parameter: Digestion Mtd. 245.1/7471 Mercury-Cold Vapor Method
Method: Digestion for Manual Cold-Vapor Mercury
Application: WW Reference Citation: USEPA-245.1
Analyst: Colette A. Clark Date Analyzed: 08/01/94

93376 Purge Well

Parameter: Digestion Method-3010 Flame-AA/ICP (Wastewater)
Method: Acid Digestion for Flame AA-ICP
Application: WW Reference Citation: USEPA-3010
Analyst: Linda A. Harrison Date Analyzed: 07/29/94

93376 Purge Well

Parameter: Digestion Method-3020 Furnace-AA (Wastewater)
Method: Acid Digestion for Furnace-AA
Application: WW Reference Citation: USEPA-3020
Analyst: Linda A. Harrison Date Analyzed: 07/29/94

93376 Purge Well

Parameter: Nickel, Total
Method: Atomic Emission-ICP
Application: WW Reference Citation: EPA-200.7/6010
Analyst: J.T. Whitmore Date Analyzed: 08/06/94

93376 Purge Well

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METHODS PAGE

Parameter: Organochlorine Pesticides USEPA METHOD 608
Method: Organochlorine Pesticides & Pcb's
Application: WW Reference Citation: USEPA-608
Analyst: Don J. Ghysels Date Analyzed: 08/18/94

93376 Purge Well

Parameter: Organochlorine Pesticides USEPA Method 608
Method: Organochlorine Pesticides & Pcb's
Application: WW Reference Citation: USEPA-608
Analyst: Karen Kennedy Brooks Date Analyzed: 08/02/94

93376 Purge Well

Parameter: Selenium, Total
Method: Atomic Absorption-Furnace, Selenium
Application: WW Reference Citation: USEPA-270.2
Analyst: Diane L. VanMale Date Analyzed: 08/02/94

93376 Purge Well

Parameter: Silver, Total
Method: Atomic Absorption-Furnace, Silver
Application: WW Reference Citation: USEPA-272.2
Analyst: Rebecca A. McColgan Date Analyzed: 07/29/94

93376 Purge Well

Parameter: Thallium, Total
Method: Atomic Absorption-Furnace, Thallium
Application: WW Reference Citation: USEPA-279.2
Analyst: Diane L. VanMale Date Analyzed: 08/03/94

93376 Purge Well

Parameter: Zinc, Total
Method: Atomic Emission-ICP
Application: WW Reference Citation: EPA-200.7/6010
Analyst: Diane L. VanMale Date Analyzed: 07/29/94

93376 Purge Well

 End of Methods Page

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STATEMENT OF DATA QUALIFICATIONS

Analysis: **Organochlorine Pesticides**
Organochlorine Pesticides & Pcb's
WW USEPA-608

Qualification:

Surrogate results are unavailable due to positive results in the sample extract resulting in a dilution of greater than 1:5.

Sample(s) Qualified: 93376 Purge Well

Note: This document is included as a part of the analytical report for the above referenced project and submittal, and should be retained as a permanent record thereof.

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32429- 1

STATEMENT OF DATA QUALIFICATIONS

Analysis: **Organochlorine Pesticides**
Organochlorine Pesticides & Pcb's
WW USEPA-608

Qualification:

Surrogate spike result(s) for this sample and analysis had a recovery of > 10%, but are below the lower control limit for this method and matrix. All positive results must be considered estimated. All < or non-dectectable results must be considered approximate.

Sample(s) Qualified: 93376 Purge Well

Note: This document is included as a part of the analytical report for the above referenced project and submittal, and should be retained as a permanent record thereof.

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APPENDIX D: FIELD FORMS

The Earth Technology Corporation

Borehole Log

Project Name: 110TH ~~FIGHTER~~ GROUP, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "A"	Borehole No. BCA-B1 — Sheet 1 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOBROBE 8M	Date Started: 06/30/94 — Total Depth (feet): 27
Drilling Method: LARGEBORE SAMPLER	Date Finished: 06/30/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 5 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH HOLEPLUG UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Sample Interval	Blow Count	Recovery	Time	FID (ppm) S/B*	PID (ppm) S/B*	Graphic	USCS or Rock Type	Lithologic Description	Remarks
0–5	BCA-B1-0001	0'-1'	NA	100%	0800–0813	NA	NA		SP	0'-5', DRIVE ONLY. SURFACE SOIL: SAND, FINE-MED GRAINED, DK BROWN W/ GRAVEL AND FINES; FAINT TRACE HYDROCARBON ODOR; SOIL APPEARS STAINED	GRASS @ SURFACE
5–7	BCA-B1-0507	05'-07'	NA	75%	0950	NA	BDL		SP	SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, ~~SLIGHTLY~~ MOIST SS 7/12	*POSSIBLE HYDROCARBON ODOR; SAMPLE SELECTED FOR LABORATORY ANALYSES: VOC, BV, PP METALS
7–10										7'-10', DRIVE ONLY	
10–12	BCA-B1-1012	10'-12'	NA	75%	~~0944~~ 1008 SS 7/12	NA	BDL		SP	SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, ~~SLIGHTLY~~ MOIST SS 7/12	
12–15										12'-15', DRIVE ONLY	
15–17	BCA-B1-1517	15'-17'	NA	75%	~~1017~~ 1024 SS 7/12	NA	BDL		SP	SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, ~~DRY~~ MOIST SS 7/12	
17–20										17'-20', DRIVE ONLY	
20–22	BCA-B1-2022	20'-22'	NA	60%	1046	NA	BDL		SP	SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, ~~DRY~~ MOIST SS 7/12	

Key * S/B = Sample reading / background reading; NA = not analyzed

The Earth Technology Corporation

Borehole Log

Project Name: 110TH FIGHTER GROUP, MIANG ; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "A"	Borehole No. BCA-B1 — Sheet 2 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 06/30/94 — Total Depth (feet): 27
Drilling Method: LARGEBORE SAMPLER	Date Finished: 06/30/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 5 — Depth to Water (feet): NA
Completion Information: BORE BACKFILLED WITH HOLEPLUG UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Interval	Blow Count	Recovery	Time	FID (ppm) S/B*	PID (ppm) S/B	Graphic	USCS or Rock Type	Lithologic Description	Remarks
22										~~25~~ ~~25~~ 22'-25', DRIVE ONLY	ROUGH DRIVING 23.5'-25'
25	BCA-B1-2527	25'-27'	NA	80%	1127	NA	BDL	SP		SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, DRY	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOC, SV, PP METALS
27										TD = 27'	(MN) COLOR: MUNSELL ROCK COLOR

Key * S/B = Sample reading / background reading; NA = not analyzed

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9/1/91

The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG ; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "A"	Borehole No. BCA-B2 — Sheet 1 of ~~2~~ 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/12/94 — Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/12/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 — Depth to Water (feet): ~~NA~~ 30± 7/12 SS
Completion Information: BOREHOLE BACKFILLED WITH HOLEPLUG UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Interval	Blow Count	Recovery	Time	FID (ppm) S/B*	PID (ppm) S/B*	Graphic	USCS or Rock Type	Lithologic Description	Remarks
0–2	BCAB2O002	00'-02'	NA	80%	0945	NA	BDL		SP	0'-0.5' GRASS, ROOTS, HIGHLY ORGANIC 0.5'-2.0' SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCAB2O507	05'-07'	NA	75%	1007	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
7–10										7'-10', DRIVE ONLY	
10–12	BCAB21012	10'-12'	NA	75%	1015	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
12–15										12'-15', DRIVE ONLY	

Key * S/B = Sample reading / background reading; NA = not analyzed

Form F-1009 9/1/91

The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI		Project Number: 94-8901-05	
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "A"	Borehole No. BCA-B2		Sheet 2 of 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY		
Drilling Equipment: GEOPROBE 8M	Date Started: 7/12/94	Total Depth (feet): 32	
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/12/94	Depth to Bedrock (feet): NA	
Drilling Fluid NA	Number of Samples: 7	Depth to Water (feet): 30±	
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16	Elevation and Datum: NA	
	Logged by: S. SMITH		
	Checked by:	Date:	

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
15–17	BCAB21517	15'-17'	NA	65%	1031	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
17–20										17'-20', DRIVE ONLY	
20–22	BCAB22022	20'-22'	NA	70%	1043	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
22–25									~~SP~~ SS 7/12	22'-25', DRIVE ONLY	
25–27	BCAB22527	25'-27'	NA	100%	1102	NA	BDL		~~SP~~ SS 7/12 SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES; VOA, SV, PP METALS
27–30									~~SP~~ SS 7/12	27'-30', DRIVE ONLY	

Key

* S/B = Sample reading / background reading; NA = not analyzed

The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG ; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "A"	Borehole No. BCA-B2 — Sheet 3 of 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/12/94 — Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/12/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 — Depth to Water (feet): 30±
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
31	BCAB23032	30'-32'	NA	90%	1123	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, WET	
32										TOTAL DEPTH = 32'	SAMPLE BCAB20002 ORIGINALLY COLLECTED W/ HAND AUGER. DUE TO SHIPPING PROBLEMS, SAMPLES BCAB20002 AND BCAB22527 WERE RESAMPLED ON 7/14/94 WITH THE GEOPROBE.

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "B"	Borehole No. BCB-B1 — Sheet 1 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/13/94 — Total Depth (feet): 27
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/13/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 6 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Interval	Blow Count	Recovery	Time	Field Analysis FID (ppm) S/B*	PID (ppm) S/B*	LOG Graphic	USCS or Rock Type	Lithologic Description	Remarks
0–2	BCBB10002	0'-02'	NA	80%	1400	NA	BPL		SP	0'-0.5' GRASS, ROOTS, HIGHLY ORGANIC; 0.5'-2.0' SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCBB10507	05'-07'	NA	75%	1418	NA	BPL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
7–10											
10–12	BCBB1012	05'-07'	NA	75%	1427	NA	BPL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, TRACE GRAVEL, LOOSE, MOIST	
12–15											

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG ; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "B"	Borehole No. BCB-B1 — Sheet 2 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/13/94 — Total Depth (feet): 27
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/13/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 6 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
16	BCBB1517	15'-17'	NA	75%	1445	NA	BDL		SP	SAND, FINE GRAINED, W/ SOME GRAVEL, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
17											
18											
19											
20											
21	BCBB12022	20'-22'	NA	75%	1511	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, TRACE GRAVEL, LOOSE, MOIST	
22											
23											
24											
25											
26	BCBB12527	25'-27'	NA	60%	1541	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, V. MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
27										TOTAL DEPTH = 27'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "B"	Borehole No. BCB-B2 — Sheet 1 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/13/94 — Total Depth (feet): 27
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/13/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 6 — Depth to Water (feet): 25±
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): — Elevation and Datum: NA
	Logged by: S.SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0–2	BCBB20002	00'-02'	NA	75%	0817	NA	BDL		SP	0'-0.5', GRASS, ROOTS, HIGHLY ORGANIC; 0.5'-2.0' SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCBB20507	05'-07'	NA	60%	0823	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
7–10										7'-10', DRIVE ONLY	
10–12	BCBB21012	10'-12'	NA	60%	0835	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, TRACE GRAVEL, LOOSE, MOIST	
12–15										12'-15', DRIVE ONLY	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "B"	Borehole No. BCB-B2 — Sheet 2 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/13/94 — Total Depth (feet): 27
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/13/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 6 — Depth to Water (feet): 25±
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Interval	Blow Count	Recovery	Time	FID (ppm) S/B*	PID (ppm) S/B*	Graphic	USCS or Rock Type	Lithologic Description	Remarks
15–17	BCBB21517	15'-17'	NA	60%	0852	NA	BDL		SP	SAND, FINE GRAINED, DARK YELLOWISH BROWN, LOOSE, MOIST	
17–20										17'-20', DRIVE ONLY	
20–22	BCBB22022	20'-22'	NA	60%	0908	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
22–25										22'-25', DRIVE ONLY	
25–27	BCBB22527	25'-27'	NA	80%	0940	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, TRACE GRAVEL, ~~M~~ LOOSE, ~~MOIST~~ SS 7/13 WET	
27										TOTAL DEPTH = 27'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "B"	Borehole No. BCB-B3 — Sheet 1 of 1
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/13/94 — Total Depth (feet): 11
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/13/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 3 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH HOLEPLUG UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0–2	BCBB30002	00'-02'	NA	80%	1000					0'-0.5' GRASS, ROOTS, HIGHLY ORGANIC 0.5'-2.0' SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCBB30507	05'-07'	NA	60%	1008					SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
7–10										7'-10', DRIVE ONLY	
10–11	BCBB3 1011	10'-11'	NA	70%	1025					SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, TRACE GRAVEL, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV PP METALS
11										TOTAL DEPTH = 11' W/ GEOPROBE REFUSAL; POSSIBLE GRAVEL OR COBBLE ZONE	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG ; BATTLE CREEK, MI		Project Number: 94-8901-05	
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "B"		Borehole No. BCB-B4	Sheet 1 of 1
Drilling Agency: GEO-MARINE		Driller: JOE GREGORY	
Drilling Equipment: GEOPROBE 8M		Date Started: 7/13/94	Total Depth (feet): 12
Drilling Method: LARGEBORE SAMPLER		Date Finished: 7/13/94	Depth to Bedrock (feet): NA
Drilling Fluid NA		Number of Samples: 3	Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION		Borehole Diameter (in): 1 1/16	Elevation and Datum: NA
		Logged by: S. SMITH	
		Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
1 2	BCBB4002	00'-02'	NA	80%	1057	NA	BDL	NA	SP	0'-0.5' GRASS, ROOTS, HIGHLY ORGANIC 0.5'-2.0' SAND, FINE GRAINED, MODERATE YELLOWISH BROWN LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
3 4 5											
6 7	BCBB4507	05'-07'	NA	70%	1105	NA	BDL	NA	SP	SAND, FINE GRAINED, TRACE GRAVEL, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA SV, PP METALS
8 9 10											
11 12	BCBB41012	10'-12'	NA	70%	1115	NA	BDL*	NA	SP	SAND, FINE GRAINED, WITH GRAVEL, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA SV, PP METALS
										TOTAL DEPTH = 12' W/ GEOPROBE REFUSAL, POSSIBLE GRAVEL OR COBBLE ZONE	* NOTE: FIELD GC SHOWED THREE PEAKS DURING BLANK RUN, COULD HAVE BEEN RESIDUAL FROM ANY OF ABOVE SAMPLES

Key * S/B = Sample reading / background reading; NA = not analyzed

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Borehole Log

Project Name: 110TH FIGHTER GROUP, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "C"	Borehole No. BCC-B1 — Sheet 1 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 14 JULY 1994 — Total Depth (feet): 17
Drilling Method: LARGEBORE SAMPLER	Date Finished: 14 JULY 1994 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 4 — Depth to Water (feet): 15±
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0–2	BCCB10002	00'-02'	NA	80%	1300	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCCB10507	05'-07'	NA	60%	1305	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, ~~MOIST~~ SS LOOSE, MOIST	
7–10										7'-10', DRIVE ONLY	
10–12	BCCB11012	10'-12'	NA	80%	1323	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, VERY MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
12–15										12'-15', DRIVE ONLY	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FIGHTER GROUP MIANG ; ~~BATT~~ SS 7/14 BATTLE CREEK, MI		Project Number: 94-8901-05	
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "C"		Borehole No. BCC-B1	Sheet 2 of 2
Drilling Agency: GEO-MARINE		Driller: JOE GREGORY	
Drilling Equipment: GEOPROBE 8M		Date Started: 7/14/94	Total Depth (feet): 17'
Drilling Method: LARGEBORE SAMPLER		Date Finished: 7/14/94	Depth to Bedrock (feet): NA
Drilling Fluid NA		Number of Samples: 4	Depth to Water (feet): ~~NA~~ SS 7/14 15±
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION		Borehole Diameter (in): 1 1/16	Elevation and Datum: NA
		Logged by: S. SMITH	
		Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
15	BCCB11517	15'-17'	NA	15%	1341	NA	BDL			SAND, MEDIUM GRAINED, MODERATE BROWN, LOOSE, WET	
17										TD BORING = 17'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FIGHTER GROUP, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "C"	Borehole No. BCC-B2 — Sheet 1 of 1
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 14 JULY 1994 — Total Depth (feet): 12'
Drilling Method: LARGEBORE SAMPLER	Date Finished: 14 JULY 1994 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 3 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Sample Interval	Blow Count	Recovery	Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
0–2	BCCB20002	00'-02'	NA	100%	1425	NA	302			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCCB20507	05'-07'		75%		NA	235			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
7–10										7'-10', DRIVE ONLY	
10–12	BCCB21012	10'-12'		60%		NA	OVER RANGE			SAND, FINE GRAINED, DUSKY YELLOWISH BROWN, LOOSE, MOIST	HYDROCARBON ODOR, SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
12										TOTAL DEPTH = 12'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG, BATTLE CREEK, MI		Project Number: 94-8901-05	
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "C"		Borehole No. BCC-B3	Sheet 1 of 2
Drilling Agency: GEO-MARINE		Driller: JOE GREGORY	
Drilling Equipment: GEOPROBE 8M		Date Started: 7/14/94	Total Depth (feet): 16
Drilling Method: LARGEBORE SAMPLER		Date Finished: 7/14/94	Depth to Bedrock (feet): NA
Drilling Fluid NA		Number of Samples: ~~3~~ 4	Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION		Borehole Diameter (in):	Elevation and Datum: NA
		Logged by: S. SMITH	
		Checked by:	Date:

Depth (feet)	Sample: Number	Interval	Blow Count	Recovery	Time	Field Analysis: FID (ppm) S/B*	PID (ppm) S/B*	LOG: Graphic	USCS or Rock Type	Lithologic Description	Remarks
0–2	BCCB3 0002	00'-02'	NA	60%	1610	NA	BDL			SAND, MODERATE YELLOWISH BROWN, FINE GRAINED, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCCB3 0507	05'-07'	NA	60%	1617 ~~1725~~	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
7–10										7'-10', DRIVE ONLY	
10–12	BCCB31012	10'-12'	NA	100%	1630	NA	BDL			SAND, FINE GRAINED, ~~DARK~~ MODERATE YELLOWISH BROWN, LOOSE, VERY MOIST	POSSIBLE STAINING ON END OF DRIVE SHOE
12–14										12'-14', DRIVE ONLY	
14–										CONTINUED NEXT PAGE	

Key * S/B = Sample reading / background reading; NA = not analyzed

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Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "C"	Borehole No. BCC-B3 — Sheet 2 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/14/94 — Total Depth (feet): 16
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/14/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 4 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S.SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Interval	Blow Count	Recovery	Time	Field Analysis: FID (ppm) S/B*	PID (ppm) S/B*	LOG: Graphic	USCS or Rock Type	Lithologic Description	Remarks
14	BCCB31416	14'-16'	NA	100%	1700	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, DAMP	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
16										TOTAL DEPTH = 16'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "C"	Borehole No. BCC-B4 — Sheet 1 of 1
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/14/94 — Total Depth (feet): 12
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/14/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 3 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S.SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
0–2	BCCB40002	00'-02'	NA	100%	1720	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCCB40507	05'-07'	NA	60%	1725	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
7–10										7'-10', DRIVE ONLY	
10–12	BCCB41012	10'-12'	NA	60%	1735	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, DAMP	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
12										TOTAL DEPTH = 12'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT ~~AERP~~ AREA OF CONCERN "C"	Borehole No. BCC-B5 — Sheet 1 of 1
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/15/94 — Total Depth (feet): 12
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/15/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 2 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH ~~BENTONITE~~ GROUT UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Sample Interval	Blow Count	Recovery	Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
0–5										0'-5', DRIVE ONLY	
5–7	BCCB50507	05'-07'	NA	75%	1600	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, MOIST, LOOSE	
7–10											
10–12	BCCB51012	10'-12'	NA	60%	1605	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, MOIST, LOOSE	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
12										TOTAL DEPTH = 12'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "C"	Borehole No. BCC-B6 — Sheet 1 of 1
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/15/94 — Total Depth (feet): 12
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/15/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 2 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH ~~BENTONITE~~ GROUT 7/15 UPON COMPLETION	Borehole Diameter (in): 1 1/6 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Sample Interval	Blow Count	Recovery	Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
0–5										0'-5', DRIVE ONLY	
5–7	BCCB60507	05'-07'	NA	80%	1630	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
7–10										7'-10', DRIVE ONLY	
10–12	BCCB61012	10'-12'	NA	60%	1641	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, DAMP	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
12										TOTAL DEPTH = 12'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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Borehole Log

Project Name: 110TH FG, MIANG ; BATTLE CREEK, MI

Project Number: 94-8901-05

Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "C"

Borehole No. BCC-B7

Sheet 1 of 1

Drilling Agency: GEO-MARINE

Driller: JOE GREGORY

Drilling Equipment: GEOPROBE 8M

Date Started: 7/15/94

Total Depth (feet): 12

Drilling Method: LARGEBORE SAMPLER

Date Finished: 7/15/94

Depth to Bedrock (feet): NA

Drilling Fluid NA

Number of Samples: 2

Depth to Water (feet): NA

Completion Information: BOREHOLE BACKFILLED WITH ~~BENTONITE~~ GROUT SS 7/15 UPON COMPLETION

Borehole Diameter (in): 1 1/16

Elevation and Datum: NA

Logged by: S.SMITH

Checked by:

Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0–5										0'-5', DRIVE ONLY	
5–7	BCCB70507	05'-07'	NA	70%	1700	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, ~~DAMP~~ 7/15 MOIST	
7–10										7'-10', DRIVE ONLY	
10–12	BCCB71012	10'-12'	NA	90%	1720	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, DAMP	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
12										TOTAL DEPTH = 12'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI		Project Number: 94-8901-05	
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "D"		Borehole No. BCO-B1	Sheet 1 of 2
Drilling Agency: GEO-MARINE		Driller: JOE GREGORY	
Drilling Equipment: GEOPROBE 8M		Date Started: 7/15/94	Total Depth (feet): 27
Drilling Method: LARGEBORE SAMPLER		Date Finished: 7/15/94	Depth to Bedrock (feet): NA
Drilling Fluid NA		Number of Samples: 5	Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION		Borehole Diameter (in): 1 1/16	Elevation and Datum: NA
		Logged by: S. SMITH	
		Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0–2	BCOB10002	00'-02'	NA	80%	0955	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCOB10507	05'-07'	NA	50%	1005	NA	BDL			SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
7–10										7'-10', DRIVE ONLY	
10–15										SAMPLER REFUSED @ 10'; PREPROBE REFUSED @ 11'; POSSIBLE GRAVEL LAYER(?) MOVE ~5'W, THEN ~5N; STILL TOO FIRM 10'-12', CONTINUE TO 15'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "D"	Borehole No. BCD-B1 — Sheet 2 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROPE 8M	Date Started: 7/15/94 — Total Depth (feet): 27
Drilling Method: LARGE BORE SAMPLER	Date Finished: 7/15/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 5 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Interval	Blow Count	Recovery	Time	Field Analysis: FID (ppm) S/B*	PID (ppm) S/B*	LOG: Graphic	USCS or Rock Type	Lithologic Description	Remarks
15	BCDB11517	15'-17'	~~1635~~ 1055	100%						SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
17										17'-20', DRIVE ONLY	
20	BCDB12022	20'-22'	~~1735~~ 1100	100%						SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
22											
25	BCDB12527	25'-27'	1125	100%						SAND, FINE GRAINED, DARK YELLOWISH BROWN, LOOSE, DAMP	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
27										TOTAL DEPTH = 27'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "D"	Borehole No. BCD-B1 2 — Sheet 1 of 1
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/15/94 — Total Depth (feet): 7
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/15/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 2 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Sample Interval	Blow Count	Recovery	Time	FID (ppm) S/B*	PID (ppm) S/B*	LOG Graphic	USCS or Rock Type	Lithologic Description	Remarks
0–2	BCDB1002	00'-02'	NA	100%	1155	NA	BDL			SAND, MODERATE YELLOWISH BROWN, FINE GRAINED, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES; VOA, SV, PP METALS
2–5										2'-5', DRIVE ONLY	
5–7	BCDB1507	05'-07'	NA	50%	1200	NA	BDL			SAND, MODERATE YELLOWISH BROWN, FINE GRAINED LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES; VOA, SV, PP METALS
7										TOTAL DEPTH = 7'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "E"	Borehole No. BCE - B1 — Sheet 1 of 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/12/94 — Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/12/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
0–2	BCEB1002	00'-02'	NA	75%	1540	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS; GRASS AT SURFACE
2–5										2'-5', DRIVE ONLY	
5–7	BCEB1507	05'-07'	NA	70%	1545	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
7–10										7'-10', DRIVE ONLY	
10–12	BCEB1012	10'-12'	NA	60%	1605	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
12–15										7'-10', DRIVE ONLY	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "E"	Borehole No. BCE-B1 / Sheet 2 of 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/12/94 / Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/12/94 / Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 / Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 / Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: / Date:

Depth (feet)	Sample Number	Interval	Blow Count	Recovery	Time	FID (ppm) S/B*	PID (ppm) S/B*	Graphic	USCS or Rock Type	Lithologic Description	Remarks
16–17	BCEB1517	15'-17'	NA	60%	1625	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, TRACE GRAVEL, LOOSE, MOIST	
17–20										17'-20', DRIVE ONLY	
20–22	BCEB12022	20'-22'	NA	70%	1643	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
22–25										22'-25', DRIVE ONLY	
25–27	BCEB12527	25'-27'	NA	60%	1705	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
27–30										27'-30', DRIVE ONLY	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "E"	Borehole No. BCE-B1 / Sheet 3 of 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/12/94 / Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/12/94 / Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 / Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 / Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: / Date:

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
31	BCEB13032	30'-32'	NA	90%	1750	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
32										TOTAL DEPTH = 32'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "E"	Borehole No. BCE-B2 — Sheet 1 of 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/12/94 — Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/12/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: ~7 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0–2	BCEB20002				1815						SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
2–5											
5–7	BCEB20507				1828						
7–10											
10–12	BCEB21012				1847						
12–15											

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG ; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "E"	Borehole No. BCE-B2 Sheet 2 of 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/12/94 / Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/12/94 / Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 / Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 / Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: / Date:

Depth (feet)	Sample: Number	Interval	Blow Count	Recovery	Time	Field Analysis: FID (ppm) S/B*	PID (ppm) S/B*	LOG: Graphic	USCS or Rock Type	Lithologic Description	Remarks
16	BCEB21517				1858						
17											
18											
19											
20											
21	BCEB22022				1912						
22											
23											
24											
25											
26	BCEB22527				1927						
27											
28											
29											
30											

Key * S/B = Sample reading / background reading; NA = not analyzed

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Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "E"	Borehole No. BCE-B2 — Sheet 3 of 3
Drilling Agency: GEO-MARINE	Driller: SS 7/12 JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/12/94 — Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/12/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
31	BCEB23032				1942						SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
32										TOTAL DEPTH = 32'	

Key * S/B = Sample reading / background reading; NA = not analyzed

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Borehole Log

Project Name: 110TH FIGHTER GROUP, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "F"	Borehole No. BCF-B1 — Sheet 1 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: Ø6/29/94 — Total Depth (feet): 37
Drilling Method: LARGEBORE SAMPLER	Date Finished: Ø6/29/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 9 — Depth to Water (feet): 35±
Completion Information: BOREHOLE BACKFILLED WITH HOLEPLUG UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
										Ø'-1', DRIVE ONLY	~0.2' ASPHALT
1	BCF-B1-Ø1Ø3	Ø1'-Ø3'	NA	60%	1117		BDL	SP		SAND, FINE GRAINED, MODERATE BROWN, LOOSE, DRY	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
3										3'-5', DRIVE ONLY	
5	BCF-B1-Ø5Ø7	Ø5'-Ø7'	NA	25% ~~80%~~ SS	1130		BDL	SP		SAND, FINE GRAINED, MODERATE BROWN, LOOSE, DRY	NSF RECOVERY, WILL PUSH SECOND ATTEMPT FOR RECOVERY
7	BCF-B1-Ø7Ø9	Ø7'-Ø9'	NA	25%	~~1137~~ SS 7/01 1130		BDL	SP		SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, DRY	NO FIELD GC SAMPLE COLLECTED
9										~~10~~ SS 9'-10', DRIVE ONLY	
10	BCF-B1-1Ø12	1Ø'-12'	NA	35%	~~1147~~ SS 7/01 1151		BDL	SP		SAND, MEDIUM TO COARSE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, DRY	
12										12'-15', DRIVEONLY	
15	BCF-B1-1517	15'-17'	NA	40%	1200		BDL	SP		SAND, MEDIUM TO COARSE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, DRY	
17										17'-~~19~~ 20' SS 7/01, DRIVE ONLY	
20 ~~19~~ SS											

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FIGHTER GROUP, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "F"	Borehole No. BCF-B1 · Sheet 2 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 06/29/94 · Total Depth (feet): 37
Drilling Method: LARGEBORE SAMPLER	Date Finished: 06/29/94 · Depth to Bedrock (feet): NA
Drilling Fluid: NA	Number of Samples: 9 · Depth to Water (feet): 35±
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 · Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: · Date:

Depth (feet)	Sample Number	Sample Interval	Blow Count	Recovery	Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
20–22	BCF-B1-2022	20'-22'	NA	40%	1221	NA	BDL	SP		SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, DRY	
22–25										~~25'-27'~~ 22'-25', DRIVE ONLY	
25–27	BCF-B1-2527	25'-27'	NA	40%	1255	NA	BDL	SP		SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, DRY	
27–30										27'-30', DRIVE ONLY	
30–32	BCF-B1-3032	30'-32'	NA	35%		NA	BDL	SP		SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, ~~DAMP~~ MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
32–35										32'-35', DRIVE ONLY	
35–37	BCF-B1-3537	35'-37'	NA	40%	1541	NA	BDL	SP		SAND, FINE TO MEDIUM GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, WET	
37										TOTAL DEPTH = 37'	DNI COLOR: MUNSELL ROCK COLOR CHART

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FIGHTER GROUP MIANG, BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "F"	Borehole No. BCF-B2 — Sheet 1 of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: ϕ6/29/94 — Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: ϕ6/30/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: ~~6~~ 7 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH HOLEPLUG UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample Number	Interval	Blow Count	Recovery	Time	FID (ppm) S/B*	PID (ppm) S/B*	LOG Graphic	USCS or Rock Type	Lithologic Description	Remarks
										ϕ'-1', DRIVE ONLY	~0.2' ASPHALT
1–3	BCF-B2-ϕ1ϕ3	ϕ1'-ϕ3'	NA	60%	1620	NA	BDL	SP		SAND, FINE GRAINED, MODERATE BROWN, LOOSE, DRY	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
3–5										3'-5', DRIVE ONLY	
5–7	BCF-B2-ϕ5ϕ7	ϕ5'-ϕ7'	NA	60%	1628	NA	BDL	SP		SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, DRY	
7–10										7'-1ϕ', DRIVE ONLY	
10–12	BCF-B2-1ϕ12	1ϕ'-12'	NA	50%	1648	NA	BDL	SP		SAND, MEDIUM GRAINED, MOTTLED MODERATE YELLOWISH BROWN, AND DARK YELLOWISH BROWN, LOOSE, DRY	
12–15										12'-15', DRIVE ONLY	
15–17	BCF-B2-1517	15'-17'	NA	55%	1659	NA	BDL	SP		SAND, MEDIUM TO COARSE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, DRY	
17–20										17'-2ϕ', DRIVE ONLY	
2ϕ										CONTINUED PAGE 2	

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FIGHTER GROUP, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT ~~EA~~ AREA OF CONCERN "F"	Borehole No. BCF-B2 · Sheet 2 ~~1~~ of 2
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 06/29/94 · Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 06/30/94 · Depth to Bedrock (feet): NA
Drilling Fluid: NA	Number of Samples: ~~6~~ SS 7 · Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH HOLEPLUG UPON COMPLETION	Borehole Diameter (in): 1 1/16 · Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: · Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
20–22	BCF-B2-2022	20'-22'	NA	60%	1738	NA	BDL	SP		SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, DRY	END SHIFT 06/29
22–25										22'-25', DRIVE ONLY	
25–27	BCF-B2-2527	25'-27'	NA	80%	0825	NA	BDL	SP		SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, DRY	BEGAN USING PVC SHRINK WRAPPED TUBES
27–30										27'-30', DRIVE ONLY	
30–32	BCF-B2-3032	30'-32'	NA	80%	0900	NA	BDL	SP		SAND, FINE GRAINED, MOTTLED MODERATE YELLOWISH BROWN AND DARK YELLOWISH BROWN, LOOSE, MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
32										TOTAL DEPTH = 32'	DN1 COLOR: MUNSELL ROCK COLOR CHART

Key * S/B = Sample reading / background reading; NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W.K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "F"	Borehole No. BCF-B3 — Sheet 1 of ~~2~~ 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/11/94 — Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/11/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH HOLEPLUG UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0–1										0'-1', DRIVE ONLY	~0.2 ASPHALT
1–3	BCFB10103	01'-03'	NA	80%	1553	NA	BDL ~~1.3 ss~~		SP	SAND, FINE GRAINED, MODERATE BROWN, LOOSE, SLIGHTLY MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
3–5										3'-5', DRIVE ONLY	
5–7	BCFB10507	05'-07'	NA	50%	1604	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	POSSIBLE ODOR, SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
7–10										7'-10', DRIVE ONLY	
10–12	BCFB11012	10'-12'	NA	30%	1616	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
12–15										12'-15', DRIVE ONLY	

Key * S/B = Sample reading / background reading; NA = not analyzed

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Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W. K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "F"	Borehole No. BCF-B3 Sheet 2 of 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/11/94 Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/11/94 Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
15–17	BCFB31517	15'-17'	NA	75%	1630	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
17–20										17'-20', DRIVE ONLY	
20–22	BCFB32022	20'-22'	NA	70%	1703	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
22–25										22'-25', DRIVE ONLY	
25–27	BCFB32527	25'-27'	NA	80%	1718	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, MOIST	
27–30										27'-30', DRIVE ONLY	

Key   * S/B = Sample reading / background reading;   NA = not analyzed

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The Earth Technology Corporation

Borehole Log

Project Name: 110TH FG, MIANG; BATTLE CREEK, MI	Project Number: 94-8901-05
Borehole Location: W. K. KELLOGG REGIONAL AIRPORT AREA OF CONCERN "F"	Borehole No. BCF-B3 — Sheet 3 of 3
Drilling Agency: GEO-MARINE	Driller: JOE GREGORY
Drilling Equipment: GEOPROBE 8M	Date Started: 7/11/94 — Total Depth (feet): 32
Drilling Method: LARGEBORE SAMPLER	Date Finished: 7/11/94 — Depth to Bedrock (feet): NA
Drilling Fluid NA	Number of Samples: 7 — Depth to Water (feet): NA
Completion Information: BOREHOLE BACKFILLED WITH BENTONITE UPON COMPLETION	Borehole Diameter (in): 1 1/16 — Elevation and Datum: NA
	Logged by: S. SMITH
	Checked by: — Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
30	BCFB33032	30'-32'	NA	80%	1753	NA	BDL		SP	SAND, FINE GRAINED, MODERATE YELLOWISH BROWN, LOOSE, V. MOIST	SAMPLE SELECTED FOR LABORATORY ANALYSES: VOA, SV, PP METALS
32										TOTAL DEPTH = 32'	

Key * S/B = Sample reading / background reading; NA = not analyzed

Form F-1009 9/1/91

APPENDIX E: LABORATORY ANALYTICAL DATABASE

LOCATOR:		BCA-B1		BCA-B1		BCA-B1		BCA-B1		BCA-B2		BCA-B2	
SAMPLE ID:		BCA-B1-0001		BCA-B1-0001DL		BCA-B1-0507		BCA-B1-2527		BCA-B2-0002		BCA-B2-2527	
COLLECTION DATE:		06/30/94		06/30/94		06/30/84		06/30/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1													
1,1,1-Trichloroethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
1,1,2,2-Tetrachloroethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
1,1,2-Trichloroethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
1,1-Dichloroethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
1,1-Dichloroethene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
1,2-Dichloroethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
1,2-Dichloroethene(Total)	UG/KG	11	U	-		11	U	11	U	11	U	10	U
1,2-Dichloropropane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
2-Butanone	UG/KG	11	U	-		11	U	11	U	11	U	10	U
2-Hexanone	UG/KG	11	U	-		11	U	11	U	11	U	10	U
4-Methyl-2-pentanone	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Acetone	UG/KG	33	B	-		11	U	190	B	11	U	10	U
Benzene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Bromodichloromethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Bromoform	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Bromomethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Carbon disulfide	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Carbon tetrachloride	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Chlorobenzene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Chloroethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Chloroform	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Chloromethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Cis-1,3-Dichloropropene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Dibromochloromethane	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Ethylbenzene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Methylene chloride	UG/KG	20	B	-		180	B	80	B	7	JB	8	JB
Styrene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Tetrachloroethene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Toluene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Trans-1,3-Dichloropropene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Trichloroethene	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Vinyl chloride	UG/KG	11	U	-		11	U	11	U	11	U	10	U
Xylenes (Total)	UG/KG	11	U	-		11	U	11	U	11	U	10	U
2													
1,2,4-Trichlorobenzene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U

LOCATOR:		BCA-B1		BCA-B1		BCA-B1		BCA-B1		BCA-B2		BCA-B2	
SAMPLE ID:		BCA-B1-0001		BCA-B1-0001DL		BCA-B1-0507		BCA-B1-2527		BCA-B2-0002		BCA-B2-2527	
COLLECTION DATE:		06/30/94		06/30/94		06/30/84		06/30/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1,2-Dichlorobenzene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
1,3-Dichlorobenzene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
1,4-Dichlorobenzene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2,2'-Oxybis(1-chloropropane)	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2,4,5-Trichlorophenol	UG/KG	880	U	4400	U	850	U	830	U	830	U	790	U
2,4,6-Trichlorophenol	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2,4-Dichlorophenol	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2,4-Dimethylphenol	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2,4-Dinitrophenol	UG/KG	880	U	4400	U	850	U	830	U	830	U	790	U
2,4-Dinitrotoluene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2,6-Dinitrotoluene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2-Chloronaphthalene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2-Chlorophenol	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2-Methylnaphthalene	UG/KG	180	()	1800	U	350	U	340	U	340	U	330	U
2-Methylphenol	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
2-Nitroaniline	UG/KG	880	U	4400	U	850	U	830	U	830	U	790	U
2-Nitrophenol	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
3,3'-Dichlorobenzidine	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
3-Nitroaniline	UG/KG	880	U	4400	U	850	U	830	U	830	U	790	U
4,6-Dinitro-2-methylphenol	UG/KG	880	U	4400	U	850	U	830	U	830	U	790	U
4-Bromophenyl phenyl ether	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
4-Chloro-3-methylphenol	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
4-Chloroaniline	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
4-Chlorophenyl phenyl ether	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
4-Methylphenol	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
4-Nitroaniline	UG/KG	880	U	4400	U	850	U	830	U	830	U	790	U
4-Nitrophenol	UG/KG	880	U	4400	U	850	U	830	U	830	U	790	U
Acenaphthene	UG/KG	340	()	270	DJ	350	U	340	U	340	U	330	U
Acenaphthylene	UG/KG	330	()	240	DJ	350	U	340	U	340	U	330	U
Anthracene	UG/KG	920		860	DJ	350	U	340	U	340	U	330	U
Benzo(a)anthracene	UG/KG	4900	E	4800	D	350	U	110	J	42	J	330	U
Benzo(a)pyrene	UG/KG	4600	E	4300	D	350	U	110	J	340	U	330	U
Benzo(b)fluoranthene	UG/KG	9800	E	6800	DX	350	U	230	XJ	72	XJ	330	U
Benzo(g,h,i)perylene	UG/KG	2300		2300	D	350	U	110	J	340	U	330	U
Benzo(k)fluoranthene	UG/KG	11000	E	10000	DX	350	U	250	XJ	77	XJ	330	U
Butyl benzyl phthalate	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U

LOCATOR: SAMPLE ID: COLLECTION DATE:		BCA-B1 BCA-B1-0001 06/30/94		BCA-B1 BCA-B1-0001DL 06/30/94		BCA-B1 BCA-B1-0507 06/30/84		BCA-B1 BCA-B1-2527 06/30/94		BCA-B2 BCA-B2-0002 07/14/94		BCA-B2 BCA-B2-2527 07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Carbazole	UG/KG	720		600	DJ	350	U	340	U	340	U	330	U
Chrysene	UG/KG	4300	E	4000	D	350	U	110	J	36	J	330	U
Di-n-butyl phthalate	UG/KG	93	()	1800	U	350	U	340	U	260	J	79	J
Di-n-octyl phthalate	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Dibenzo(a,h)anthracene	UG/KG	510		420	DJ	350	U	340	U	340	U	330	U
Dibenzofuran	UG/KG	270	()	250	DJ	350	U	340	U	340	U	330	U
Diethyl phthalate	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Dimethyl phthalate	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Fluoranthene	UG/KG	7300	E	9500	D	350	U	260	J	97	J	330	U
Fluorene	UG/KG	520		470	DJ	350	U	340	U	340	U	330	U
Hexachlorobenzene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Hexachlorobutadiene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Hexachlorocyclopentadiene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Hexachloroethane	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Indeno(1,2,3-cd)pyrene	UG/KG	2400		2400	D	350	U	96	J	340	U	330	U
Isophorone	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
N-Nitroso-di-n-propylamine	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
N-Nitrosodiphenylamine(1)	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Naphthalene	UG/KG	170	()	1800	U	350	U	340	U	340	U	330	U
Nitrobenzene	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Pentachlorophenol	UG/KG	880	U	4400	U	850	U	830	U	830	U	790	U
Phenanthrene	UG/KG	5400	E	5500	D	350	U	130	J	59	J	330	U
Phenol	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
Pyrene	UG/KG	6500	E	7200	D	350	U	190	J	66	J	330	U
bis(2-Chloroethoxy)methane	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
bis(2-Chloroethyl)ether	UG/KG	360	U	1800	U	350	U	340	U	340	U	330	U
bis(2-Ethylhexyl)phthalate	UG/KG	280	(B)	210	DJB	99	JB	690	B	85	J	330	U
3													
Antimony	MG/KG	3.40	UL	-		4.30	N	3.20	UN	3.50	*	3.10	U*
Arsenic	MG/KG	39.60		-		75.40	*	5.40	N	8.70	N	5.20	AN
Barium	MG/KG	-		-		-		-		-		-	
Beryllium	MG/KG	0.28	()	-		0.13	B	0.12	U	0.12	U	0.11	U
Cadmium	MG/KG	0.49	(L)	-		0.36	UN	0.36	UN	0.36	U	0.35	U
Chromium	MG/KG	23	L	-		6.10	N	8.40	N	6.50	*	3.30	*
Chromuim, Cr+6	mg/L	0	U	-		0	U	0	U	0	U	0	U

	LOCATOR:	BCA-B1		BCA-B1		BCA-B1		BCA-B1		BCA-B2		BCA-B2	
	SAMPLE ID:	BCA-B1-0001		BCA-B1-0001DL		BCA-B1-0507		BCA-B1-2527		BCA-B2-0002		BCA-B2-2527	
	COLLECTION DATE:	06/30/94		06/30/94		06/30/84		06/30/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Copper	MG/KG	8.20		-		6.20		4.10		4.80		2.80	
Lead	MG/KG	124		-		33	*	3.60	*	3.80	N	1.90	N
Mercury	MG/KG	0.11	U	-		0.11	U	0.10	U	0.10	U	0.10	U
Nickel	MG/KG	8.70		-		7.60		299		5.70	*	4.10	U*
Selenium	MG/KG	0.43	UL	-		0.41	UWN	0.41	UWN	0.41	UWN	0.40	UWN
Silver	MG/KG	0.44	U	-		0.42	U	0.42	U	0.42	U	0.41	U
Thallium	MG/KG	0.40	U	-		0.38	U	0.38	U	0.38	UW	0.37	U
Zinc	MG/KG	75	L	-		14.80	EN	19.30	EN	15	E	11.70	E

LOCATOR:		BCA		BCA		BCA		BCA		BCA		BCA	
SAMPLE ID:		BCA-SS01		BCA-SS01DL		BCA-SS02		BCA-SS02DL		BCA-SS03		BCA-SS03DL	
COLLECTION DATE:		11/10/94		11/10/94		11/10/94		11/10/94		11/10/94		11/10/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
2													
1,2,4-Trichlorobenzene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
1,2-Dichlorobenzene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
1,3-Dichlorobenzene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
1,4-Dichlorobenzene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2,2'-Oxybis(1-chloropropane)	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2,4,5-Trichlorophenol	UG/KG	890	U	3500	U	930	U	1900	U	950	U	2900	U
2,4,6-Trichlorophenol	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2,4-Dichlorophenol	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2,4-Dimethylphenol	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2,4-Dinitrophenol	UG/KG	890	U	3500	U	930	U	1900	U	950	U	2900	U
2,4-Dinitrotoluene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2,6-Dinitrotoluene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2-Chloronaphthalene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2-Chlorophenol	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2-Methylnaphthalene	UG/KG	46	J	1500	U	110	J	120	DJ	150	J	140	DJ
2-Methylphenol	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
2-Nitroaniline	UG/KG	890	U	3500	U	930	U	1900	U	950	U	2900	U
2-Nitrophenol	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
3,3'-Dichlorobenzidine	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
3-Nitroaniline	UG/KG	890	U	3500	U	930	U	1900	U	950	U	2900	U
4,6-Dinitro-2-methylphenol	UG/KG	890	U	3500	U	930	U	1900	U	950	U	2900	U
4-Bromophenyl phenyl ether	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
4-Chloro-3-methylphenol	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
4-Chloroaniline	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
4-Chlorophenyl phenyl ether	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
4-Methylphenol	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
4-Nitroaniline	UG/KG	890	U	3500	U	930	U	1900	U	950	U	2900	U
4-Nitrophenol	UG/KG	890	U	3500	U	930	U	1900	U	950	U	2900	U
Acenaphthene	UG/KG	160	J	250	DJ	330	J	380	DJ	660		670	DJ
Acenaphthylene	UG/KG	370	U	1500	U	41	J	760	U	53	J	1200	U
Anthracene	UG/KG	230	J	400	DJ	470		640	DJ	700		830	DJ
Benzo(a)anthracene	UG/KG	1700		2400	D	2800		3200	D	3700	D	3700	D
Benzo(a)pyrene	UG/KG	1700		2700	D	2300		3100	D	2800		3600	D
Benzo(b)fluoranthene	UG/KG	4800	DX	4800	DX	5800	DX	5800	DX	6900	DX	6900	DX
Benzo(g,h,i)perylene	UG/KG	920		1900	D	1500		1700	D	1600		2000	D
Benzo(k)fluoranthene	UG/KG	5200	DX	5200	DX	5900	DX	5900	DX	7000	DX	7000	DX
Butyl benzyl phthalate	UG/KG	65	J	1500	U	380	U	760	U	390	U	1200	U

LOCATOR:		BCA		BCA		BCA		BCA		BCA		BCA	
SAMPLE ID:		BCA-SS01		BCA-SS01DL		BCA-SS02		BCA-SS02DL		BCA-SS03		BCA-SS03DL	
COLLECTION DATE:		11/10/94		11/10/94		11/10/94		11/10/94		11/10/94		11/10/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Carbazole	UG/KG	210	J	380	DJ	440		530	DJ	880		870	DJ
Chrysene	UG/KG	1800		3100	D	2600		3300	D	4400	D	4400	D
Di-n-butyl phthalate	UG/KG	370	U	1500	U	71	J	86	DJ	68	J	1200	U
Di-n-octyl phthalate	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Dibenzo(a,h)anthracene	UG/KG	200	J	460	DJ	290	J	510	DJ	510		630	DJ
Dibenzofuran	UG/KG	84	J	1500	U	190	J	210	DJ	370	J	370	DJ
Diethyl phthalate	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Dimethyl phthalate	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Fluoranthene	UG/KG	2500		5300	D	5600	D	5600	D	7300	D	7300	D
Fluorene	UG/KG	160	J	260	DJ	330	J	380	DJ	520		610	DJ
Hexachlorobenzene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Hexachlorobutadiene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Hexachlorocyclopentadiene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Hexachloroethane	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Indeno(1,2,3-cd)pyrene	UG/KG	880		1800	D	1500		1700	D	1600		1800	D
Isophorone	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
N-Nitroso-di-n-propylamine	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
N-Nitrosodiphenylamine(1)	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Naphthalene	UG/KG	48	J	1500	U	180	J	210	DJ	450		450	DJ
Nitrobenzene	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Pentachlorophenol	UG/KG	890	U	3500	U	930	U	1900	U	950	U	2900	U
Phenanthrene	UG/KG	1600		3200	D	2800		3700	D	5700	D	5700	D
Phenol	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
Pyrene	UG/KG	2400		4500	D	4800	D	4800	D	6800	D	6800	D
bis(2-Chloroethoxy)methane	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
bis(2-Chloroethyl)ether	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
bis(2-Ethylhexyl)phthalate	UG/KG	370	U	1500	U	380	U	760	U	390	U	1200	U
3													
Antimony	MG/KG	10.70	UN	-		11.50	UN	-		12.10	UN	-	
Arsenic	MG/KG	9	N	-		13.80	N	-		6.50	N	-	
Barium	MG/KG	37.30	B	-		76.70		-		53.50		-	
Beryllium	MG/KG	0.26	B	-		0.50	B	-		0.37	B	-	
Cadmium	MG/KG	0.90	U	-		0.98	U	-		1	U	-	
Chromium	MG/KG	12	*	-		10.80	*	-		10	*	-	
Chromuim, Cr+6	mg/L	-		-		-		-		-		-	

	LOCATOR:	BCA		BCA		BCA		BCA		BCA		BCA	
	SAMPLE ID:	BCA-SS01		BCA-SS01DL		BCA-SS02		BCA-SS02DL		BCA-SS03		BCA-SS03DL	
	COLLECTION DATE:	11/10/94		11/10/94		11/10/94		11/10/94		11/10/94		11/10/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Copper	MG/KG	8.80	*	-		10.50	*	-		8.20	*	-	
Lead	MG/KG	51.60		-		62		-		46.90		-	
Mercury	MG/KG	0.11	U	-		0.12	U	-		0.12	U	-	
Nickel	MG/KG	9.20		-		10.50		-		8.70	B	-	
Selenium	MG/KG	0.62	UWN	-		0.65	UN	-		0.67	UWN	-	
Silver	MG/KG	0.67	U	-		0.73	U	-		0.76	U	-	
Thallium	MG/KG	0.79	U	-		0.83	U	-		0.86	U	-	
Zinc	MG/KG	58.20	*	-		53.80	*	-		40.40	*	-	

LOCATOR:		BCB-B1		BCB-B1		BCB-B2		BCB-B2		BCB-B2		BCB-B3	
SAMPLE ID:		BCB-B1-0002		BCB-B1-2527		BCB-B2-0002		BCB-B2-0002RE		BCB-B2-2022		BCB-B3-0002	
COLLECTION DATE:		07/13/94		07/13/94		07/13/94		07/13/94		07/13/94		07/13/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1													
1,1,1-Trichloroethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
1,1,2,2-Tetrachloroethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
1,1,2-Trichloroethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
1,1-Dichloroethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
1,1-Dichloroethene	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
1,2-Dichloroethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
1,2-Dichloroethene(Total)	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
1,2-Dichloropropane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
2-Butanone	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
2-Hexanone	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
4-Methyl-2-pentanone	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Acetone	UG/KG	29	B	32	B	37	B	69	B	27	B	25	B
Benzene	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Bromodichloromethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Bromoform	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Bromomethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Carbon disulfide	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Carbon tetrachloride	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Chlorobenzene	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Chloroethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Chloroform	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Chloromethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Cis-1,3-Dichloropropene	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Dibromochloromethane	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Ethylbenzene	UG/KG	11	U	11	U	11	U	11	U	7	JB	51	B
Methylene chloride	UG/KG	10	JB	9	JB	14	B	59	B	10	U	10	U
Styrene	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Tetrachloroethene	UG/KG	11	U	11	U	1	J	11	U	10	U	10	U
Toluene	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Trans-1,3-Dichloropropene	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Trichloroethene	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Vinyl chloride	UG/KG	11	U	11	U	11	U	11	U	10	U	10	U
Xylenes (Total)	UG/KG	11	U	11	U	11	U	11	U				
2													
1,2,4-Trichlorobenzene	UG/KG	360	U	340	U	350	U	-		340	U	340	U

LOCATOR:		BCB-B1		BCB-B1		BCB-B2		BCB-B2		BCB-B2		BCB-B3	
SAMPLE ID:		BCB-B1-0002		BCB-B1-2527		BCB-B2-0002		BCB-B2-0002RE		BCB-B2-2022		BCB-B3-0002	
COLLECTION DATE:		07/13/94		07/13/94		07/13/94		07/13/94		07/13/94		07/13/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1,2-Dichlorobenzene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
1,3-Dichlorobenzene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
1,4-Dichlorobenzene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2,2'-Oxybis(1-chloropropane)	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2,4,5-Trichlorophenol	UG/KG	870	U	830	U	840	U	-		820	U	830	U
2,4,6-Trichlorophenol	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2,4-Dichlorophenol	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2,4-Dimethylphenol	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2,4-Dinitrophenol	UG/KG	870	U	830	U	840	U	-		820	U	830	U
2,4-Dinitrotoluene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2,6-Dinitrotoluene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2-Chloronaphthalene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2-Chlorophenol	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2-Methylnaphthalene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2-Methylphenol	UG/KG	360	U	340	U	350	U	-		340	U	340	U
2-Nitroaniline	UG/KG	870	U	830	U	840	U	-		820	U	830	U
2-Nitrophenol	UG/KG	360	U	340	U	350	U	-		340	U	340	U
3,3'-Dichlorobenzidine	UG/KG	360	U	340	U	350	U	-		340	U	340	U
3-Nitroaniline	UG/KG	870	U	830	U	840	U	-		820	U	830	U
4,6-Dinitro-2-methylphenol	UG/KG	870	U	830	U	840	U	-		820	U	830	U
4-Bromophenyl phenyl ether	UG/KG	360	U	340	U	350	U	-		340	U	340	U
4-Chloro-3-methylphenol	UG/KG	360	U	340	U	350	U	-		340	U	340	U
4-Chloroaniline	UG/KG	360	U	340	U	350	U	-		340	U	340	U
4-Chlorophenyl phenyl ether	UG/KG	360	U	340	U	350	U	-		340	U	340	U
4-Methylphenol	UG/KG	360	U	340	U	350	U	-		340	U	340	U
4-Nitroaniline	UG/KG	870	U	830	U	840	U	-		820	U	830	U
4-Nitrophenol	UG/KG	870	U	830	U	840	U	-		820	U	830	U
Acenaphthene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Acenaphthylene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Anthracene	UG/KG	82	J	340	U	70	J	-		340	U	49	J
Benzo(a)anthracene	UG/KG	680		340	U	310	J	-		340	U	490	
Benzo(a)pyrene	UG/KG	760		340	U	210	J	-		340	U	520	
Benzo(b)fluoranthene	UG/KG	1300	X	340	U	440	X	-		340	U	1000	X
Benzo(g,h,i)perylene	UG/KG	300	J	340	U	120	J	-		340	U	100	J
Benzo(k)fluoranthene	UG/KG	1800	X	340	U	600	X	-		340	U	1400	X
Butyl benzyl phthalate	UG/KG	360	U	340	U	350	U	-		340	U	340	U

	LOCATOR:	BCB-B1		BCB-B1		BCB-B2		BCB-B2		BCB-B2		BCB-B3	
	SAMPLE ID:	BCB-B1-0002		BCB-B1-2527		BCB-B2-0002		BCB-B2-0002RE		BCB-B2-2022		BCB-B3-0002	
	COLLECTION DATE:	07/13/94		07/13/94		07/13/94		07/13/94		07/13/94		07/13/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Carbazole	UG/KG	65	J	340	U	350	U	-		340	U	340	U
Chrysene	UG/KG	850		340	U	260	J	-		340	U	590	
Di-n-butyl phthalate	UG/KG	45	J	45	J	350	U	-		48	J	340	U
Di-n-octyl phthalate	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Dibenzo(a,h)anthracene	UG/KG	130	J	340	U	30	J	-		340	U	85	J
Dibenzofuran	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Diethyl phthalate	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Dimethyl phthalate	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Fluoranthene	UG/KG	1200		340	U	410		-		340	U	850	
Fluorene	UG/KG	44	J	340	U	350	U	-		340	U	340	U
Hexachlorobenzene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Hexachlorobutadiene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Hexachlorocyclopentadiene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Hexachloroethane	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Indeno(1,2,3-cd)pyrene	UG/KG	540		340	U	160	J	-		340	U	220	J
Isophorone	UG/KG	360	U	340	U	350	U	-		340	U	340	U
N-Nitroso-di-n-propylamine	UG/KG	360	U	340	U	350	U	-		340	U	340	U
N-Nitrosodiphenylamine(1)	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Naphthalene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Nitrobenzene	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Pentachlorophenol	UG/KG	870	U	830	U	840	U	-		820	U	830	U
Phenanthrene	UG/KG	650		340	U	210	J	-		340	U	330	J
Phenol	UG/KG	360	U	340	U	350	U	-		340	U	340	U
Pyrene	UG/KG	930		340	U	330	J	-		340	U	650	
bis(2-Chloroethoxy)methane	UG/KG	360	U	340	U	350	U	-		340	U	340	U
bis(2-Chloroethyl)ether	UG/KG	360	U	340	U	350	U	-		340	U	340	U
bis(2-Ethylhexyl)phthalate	UG/KG	230	J	340	U	160	J	-		340		340	U
3													
Antimony	MG/KG	3.30	UN	3.20	UN	3.20	UN	-		3.50	N	3.10	UN
Arsenic	MG/KG	7.60	AN	2	N	3	AN	-		5.30	N	8.70	N
Barium	MG/KG	-		-		-		-		-		-	
Beryllium	MG/KG	0.21	B	0.12	U	0.16	B	-		0.12	B	0.22	B
Cadmium	MG/KG	0.37	UN	0.36	UN	2.70	N	-		0.35	UN	0.35	U
Chromium	MG/KG	9.90	N	3.30	N	58.10	N	-		8.50	N	6.80	N
Chromuim, Cr+6	mg/L	0	U	0	U	0.02		-		0	U	0	U

	LOCATOR:	BCB-B1		BCB-B1		BCB-B2		BCB-B2		BCB-B2		BCB-B3	
	SAMPLE ID:	BCB-B1-0002		BCB-B1-2527		BCB-B2-0002		BCB-B2-0002RE		BCB-B2-2022		BCB-B3-0002	
	COLLECTION DATE:	07/13/94		07/13/94		07/13/94		07/13/94		07/13/94		07/13/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Copper	MG/KG	12.40		2.50	B	24.60		-		6.40		6.10	
Lead	MG/KG	36.30		2.20	A*	200		-		3.40	*	13.70	*
Mercury	MG/KG	0.11	U	0.10	U	0.11	U	-		0.10	U	0.10	U
Nickel	MG/KG	8.90		4.20	U	4.30	U	-		15.10		9	
Selenium	MG/KG	0.43	UN	0.41	UWN	0.42	UWN	-		0.40	UWN	0.41	UWN
Silver	MG/KG	0.44	U	0.42	U	0.43	U	-		0.41	U	0.42	U
Thallium	MG/KG	0.39	U	0.38	U	0.38	U	-		0.37	UW	0.38	U
Zinc	MG/KG	41.20	EN	12.80	EN	112	EN	-		17.80	EN	25	EN

	LOCATOR:	BCB-B3		BCB-B4		BCB-B4		BCB-B4		BCC-B1		BCC-B1	
	SAMPLE ID:	BCB-B3-1011		BCB-B4-0002		BCB-B4-0507		BCB-B4-1012		BCC-B1-0002		BCC-B1-1012	
	COLLECTION DATE:	07/13/94		07/13/94		07/13/94		07/13/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1													
1,1,1-Trichloroethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
1,1,2,2-Tetrachloroethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
1,1,2-Trichloroethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
1,1-Dichloroethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
1,1-Dichloroethene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
1,2-Dichloroethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
1,2-Dichloroethene(Total)	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
1,2-Dichloropropane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
2-Butanone	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
2-Hexanone	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
4-Methyl-2-pentanone	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Acetone	UG/KG	25	B	23	B	24	B	21	B	11	U	30	
Benzene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Bromodichloromethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Bromoform	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Bromomethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Carbon disulfide	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Carbon tetrachloride	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Chlorobenzene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Chloroethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Chloroform	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Chloromethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Cis-1,3-Dichloropropene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Dibromochloromethane	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Ethylbenzene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Methylene chloride	UG/KG	7	JB	9	JB	0	(B)	8	JB	9	JB	27	B
Styrene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Tetrachloroethene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Toluene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Trans-1,3-Dichloropropene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Trichloroethene	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Vinyl chloride	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
Xylenes (Total)	UG/KG	10	U	10	U	10	U	10	U	11	U	12	U
2													
1,2,4-Trichlorobenzene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U

LOCATOR:		BCB-B3		BCB-B4		BCB-B4		BCB-B4		BCC-B1		BCC-B1	
SAMPLE ID:		BCB-B3-1011		BCB-B4-0002		BCB-B4-0507		BCB-B4-1012		BCC-B1-0002		BCC-B1-1012	
COLLECTION DATE:		07/13/94		07/13/94		07/13/94		07/13/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1,2-Dichlorobenzene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
1,3-Dichlorobenzene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
1,4-Dichlorobenzene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2,2'-Oxybis(1-chloropropane)	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2,4,5-Trichlorophenol	UG/KG	820	U	820	U	810	U	820	U	840	U	940	U
2,4,6-Trichlorophenol	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2,4-Dichlorophenol	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2,4-Dimethylphenol	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2,4-Dinitrophenol	UG/KG	820	U	820	U	810	U	820	U	840	U	940	U
2,4-Dinitrotoluene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2,6-Dinitrotoluene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2-Chloronaphthalene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2-Chlorophenol	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2-Methylnaphthalene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2-Methylphenol	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
2-Nitroaniline	UG/KG	820	U	820	U	810	U	820	U	840	U	940	U
2-Nitrophenol	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
3,3'-Dichlorobenzidine	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
3-Nitroaniline	UG/KG	820	U	820	U	810	U	820	U	840	U	940	U
4,6-Dinitro-2-methylphenol	UG/KG	820	U	820	U	810	U	820	U	840	U	940	U
4-Bromophenyl phenyl ether	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
4-Chloro-3-methylphenol	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
4-Chloroaniline	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
4-Chlorophenyl phenyl ether	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
4-Methylphenol	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
4-Nitroaniline	UG/KG	820	U	820	U	810	U	820	U	840	U	940	U
4-Nitrophenol	UG/KG	820	U	820	U	810	U	820	U	840	U	940	U
Acenaphthene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Acenaphthylene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Anthracene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Benzo(a)anthracene	UG/KG	340	U	55	J	340	U	340	U	350	U	390	U
Benzo(a)pyrene	UG/KG	340	U	56	J	340	U	340	U	350	U	390	U
Benzo(b)fluoranthene	UG/KG	340	U	100	XJ	340	U	340	U	350	U	390	U
Benzo(g,h,i)perylene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Benzo(k)fluoranthene	UG/KG	340	U	140	XJ	340	U	340	U	350	U	390	U
Butyl benzyl phthalate	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U

LOCATOR:		BCB-B3		BCB-B4		BCB-B4		BCB-B4		BCC-B1		BCC-B1	
SAMPLE ID:		BCB-B3-1011		BCB-B4-0002		BCB-B4-0507		BCB-B4-1012		BCC-B1-0002		BCC-B1-1012	
COLLECTION DATE:		07/13/94		07/13/94		07/13/94		07/13/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Carbazole	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Chrysene	UG/KG	340	U	74	J	340	U	340	U	350	U	390	U
Di-n-butyl phthalate	UG/KG	340	U	340	U	340	U	340	U	100	J	82	J
Di-n-octyl phthalate	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Dibenzo(a,h)anthracene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Dibenzofuran	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Diethyl phthalate	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Dimethyl phthalate	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Fluoranthene	UG/KG	340	U	140	J	340	U	340	U	350	U	390	U
Fluorene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Hexachlorobenzene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Hexachlorobutadiene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Hexachlorocyclopentadiene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Hexachloroethane	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Indeno(1,2,3-cd)pyrene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Isophorone	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
N-Nitroso-di-n-propylamine	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
N-Nitrosodiphenylamine(1)	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Naphthalene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Nitrobenzene	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Pentachlorophenol	UG/KG	820	U	820	U	810	U	820	U	840	U	940	U
Phenanthrene	UG/KG	340	U	80	J	340	U	340	U	350	U	390	U
Phenol	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
Pyrene	UG/KG	340	U	100	J	340	U	340	U	350	U	390	U
bis(2-Chloroethoxy)methane	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
bis(2-Chloroethyl)ether	UG/KG	340	U	340	U	340	U	340	U	350	U	390	U
bis(2-Ethylhexyl)phthalate	UG/KG	340	U	340	U	340	U	150	J	77	J	63	J
3													
Antimony	MG/KG	4.70	N	3.20	N	3.80	L	3.10	UN	3.20	U*	3.60	U*
Arsenic	MG/KG	8.50	N	11.40	N	12.70	L	2.10	AN	1.90	N	1.80	N
Barium	MG/KG	-		-		-		-		-		-	
Beryllium	MG/KG	0.22	B	0.11	U	0.13	()	0.11	U	0.12	U	0.13	U
Cadmium	MG/KG	0.35	UN	0.35	UN	0.35	UL	0.35	UN	0.36	U	0.40	U
Chromium	MG/KG	8.20	N	7.30	N	8	L	6.20	N	6.10	*	5.30	*
Chromuim, Cr+6	mg/L	0	U	0	U	0	U	0	U	0	U	0	U

	LOCATOR:	BCB-B3		BCB-B4		BCB-B4		BCB-B4		BCC-B1		BCC-B1	
	SAMPLE ID:	BCB-B3-1011		BCB-B4-0002		BCB-B4-0507		BCB-B4-1012		BCC-B1-0002		BCC-B1-1012	
	COLLECTION DATE:	07/13/94		07/13/94		07/13/94		07/13/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Copper	MG/KG	6.80		7.30		4.40		3.80		6		2	B
Lead	MG/KG	6.50	*	16.20	*	4.50		1.80	*	10.20	N	1.60	N
Mercury	MG/KG	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.12	U
Nickel	MG/KG	10.90		10.30		6.90		21.30		4.50	*	4.70	U*
Selenium	MG/KG	0.40	UWN	0.40	UWN	0.40	UL	0.40	UWN	0.41	UWN	0.46	UWN
Silver	MG/KG	0.41	U	0.41	U	0.41	U	0.41	U	0.42	U	0.48	U
Thallium	MG/KG	0.37	UW	0.37	U	0.37	U	0.37	UW	0.38	U	0.43	U
Zinc	MG/KG	18.40	EN	36.50	EN	29.90	L	13.40	EN	16	E	10.80	E

LOCATOR:		BCC-B2		BCC-B2		BCC-B2		BCC-B3		BCC-B3		BCC-B4	
SAMPLE ID:		BCC-B2-0002		BCC-B2-0507		BCC-B2-1012		BCC-B3-0002		BCC-B3-1416		BCC-B4-0002	
COLLECTION DATE:		07/14/94		07/14/94		07/14/94		07/14/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1													
1,1,1-Trichloroethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
1,1,2,2-Tetrachloroethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
1,1,2-Trichloroethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
1,1-Dichloroethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
1,1-Dichloroethene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
1,2-Dichloroethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
1,2-Dichloroethene(Total)	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
1,2-Dichloropropane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
2-Butanone	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
2-Hexanone	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
4-Methyl-2-pentanone	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Acetone	UG/KG	19	B	30	B	31		14	B	31	B	11	B
Benzene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Bromodichloromethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Bromoform	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Bromomethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Carbon disulfide	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Carbon tetrachloride	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Chlorobenzene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Chloroethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Chloroform	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Chloromethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Cis-1,3-Dichloropropene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Dibromochloromethane	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Ethylbenzene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Methylene chloride	UG/KG	15	B	8	JB	13	B	9	JB	17	B	5	JB
Styrene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Tetrachloroethene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Toluene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Trans-1,3-Dichloropropene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Trichloroethene	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Vinyl chloride	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
Xylenes (Total)	UG/KG	10	U	11	U	12	U	11	U	12	U	10	U
2													
1,2,4-Trichlorobenzene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U

LOCATOR:		BCC-B2		BCC-B2		BCC-B2		BCC-B3		BCC-B3		BCC-B4	
SAMPLE ID:		BCC-B2-0002		BCC-B2-0507		BCC-B2-1012		BCC-B3-0002		BCC-B3-1416		BCC-B4-0002	
COLLECTION DATE:		07/14/94		07/14/94		07/14/94		07/14/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1,2-Dichlorobenzene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
1,3-Dichlorobenzene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
1,4-Dichlorobenzene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2,2'-Oxybis(1-chloropropane)	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2,4,5-Trichlorophenol	UG/KG	830	U	840	U	15000	U	830	U	920	U	830	U
2,4,6-Trichlorophenol	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2,4-Dichlorophenol	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2,4-Dimethylphenol	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2,4-Dinitrophenol	UG/KG	830	U	840	U	15000	U	830	U	920	U	830	U
2,4-Dinitrotoluene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2,6-Dinitrotoluene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2-Chloronaphthalene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2-Chlorophenol	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2-Methylnaphthalene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2-Methylphenol	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
2-Nitroaniline	UG/KG	830	U	840	U	15000	U	830	U	920	U	830	U
2-Nitrophenol	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
3,3'-Dichlorobenzidine	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
3-Nitroaniline	UG/KG	830	U	840	U	15000	U	830	U	920	U	830	U
4,6-Dinitro-2-methylphenol	UG/KG	830	U	840	U	15000	U	830	U	920	U	830	U
4-Bromophenyl phenyl ether	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
4-Chloro-3-methylphenol	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
4-Chloroaniline	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
4-Chlorophenyl phenyl ether	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
4-Methylphenol	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
4-Nitroaniline	UG/KG	830	U	840	U	15000	U	830	U	920	U	830	U
4-Nitrophenol	UG/KG	830	U	840	U	15000	U	830	U	920	U	830	U
Acenaphthene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Acenaphthylene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Anthracene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Benzo(a)anthracene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Benzo(a)pyrene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Benzo(b)fluoranthene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Benzo(g,h,i)perylene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Benzo(k)fluoranthene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Butyl benzyl phthalate	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U

LOCATOR: / SAMPLE ID: / COLLECTION DATE:	UNITS:	BCC-B2 / BCC-B2-0002 / 07/14/94 RESULT	QUAL	BCC-B2 / BCC-B2-0507 / 07/14/94 RESULT	QUAL	BCC-B2 / BCC-B2-1012 / 07/14/94 RESULT	QUAL	BCC-B3 / BCC-B3-0002 / 07/14/94 RESULT	QUAL	BCC-B3 / BCC-B3-1416 / 07/14/94 RESULT	QUAL	BCC-B4 / BCC-B4-0002 / 07/14/94 RESULT	QUAL
Carbazole	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Chrysene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Di-n-butyl phthalate	UG/KG	92	J	79	J	6100	U	74	J	66	J	120	J
Di-n-octyl phthalate	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Dibenzo(a,h)anthracene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Dibenzofuran	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Diethyl phthalate	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Dimethyl phthalate	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Fluoranthene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Fluorene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Hexachlorobenzene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Hexachlorobutadiene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Hexachlorocyclopentadiene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Hexachloroethane	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Indeno(1,2,3-cd)pyrene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Isophorone	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
N-Nitroso-di-n-propylamine	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
N-Nitrosodiphenylamine(1)	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Naphthalene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Nitrobenzene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Pentachlorophenol	UG/KG	830	U	840	U	15000	U	830	U	920	U	830	U
Phenanthrene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Phenol	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
Pyrene	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
bis(2-Chloroethoxy)methane	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
bis(2-Chloroethyl)ether	UG/KG	340	U	350	U	6100	U	340	U	380	U	340	U
bis(2-Ethylhexyl)phthalate	UG/KG	38	J	350	U	6100	U	140	J	320	J	340	U
3													
Antimony	MG/KG	3.10	U*	3.20	U*	3.70	UL	3.20	U*	3.50	U*	3.10	U*
Arsenic	MG/KG	8.70	AN	8.20	AN	1.60		2.10	N	2	N	1.50	N
Barium	MG/KG	-		-		-		-		-		-	
Beryllium	MG/KG	0.11	U	0.12	U	0.14	U	0.12	U	0.13	U	0.14	B
Cadmium	MG/KG	0.35	U	0.36	U	0.42	U	0.36	U	0.40	U	0.39	
Chromium	MG/KG	7.10	*	3.40	*	5.10		5.60	*	7	*	5.40	*
Chromuim, Cr+6	mg/L	0.02		0	U	0.01		0.01		0	U	0	U

		BCC-B2		BCC-B2		BCC-B2		BCC-B3		BCC-B3		BCC-B4	
	LOCATOR:	BCC-B2		BCC-B2		BCC-B2		BCC-B3		BCC-B3		BCC-B4	
	SAMPLE ID:	BCC-B2-0002		BCC-B2-0507		BCC-B2-1012		BCC-B3-0002		BCC-B3-1416		BCC-B4-0002	
	COLLECTION DATE:	07/14/94		07/14/94		07/14/94		07/14/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Copper	MG/KG	3.50		2.80		3.50		3.60		2.90	B	4.10	
Lead	MG/KG	2.80	N	2.10	N	1.60	L	1.90	N	1.80	N	2.50	N
Mercury	MG/KG	0.10	U	0.11	U	0.12	U	0.10	U	0.12	U	0.10	U
Nickel	MG/KG	8.80	*	15.20	*	4.90	U	4.20	U*	27.50	*	4.10	U*
Selenium	MG/KG	0.40	UWN	0.41	UWN	0.48	UL	0.41	UWN	0.46	UWN	0.40	UWN
Silver	MG/KG	0.41	U	0.42	U	0.50	U	0.42	U	0.47	U	0.41	U
Thallium	MG/KG	0.37	U	0.38	U	0.45	U	0.38	U	0.42	U	0.37	U
Zinc	MG/KG	12	E	12.60	E	11.70		11.70	E	8.80	E	14.90	E

LOCATOR:		BCC-B4		BCC-B5		BCC-B6		BCC-B7		BCD-B1		BCD-B1	
SAMPLE ID:		BCC-B4-1012		BCC-B5-1012		BCC-B6-1012		BCC-B7-1012		BCD-B1-0002		BCD-B1-2527	
COLLECTION DATE:		07/14/94		07/15/94		07/15/94		07/15/94		07/15/94		07/15/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1													
1,1,1-Trichloroethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
1,1,2,2-Tetrachloroethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
1,1,2-Trichloroethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
1,1-Dichloroethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
1,1-Dichloroethene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
1,2-Dichloroethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
1,2-Dichloroethene(Total)	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
1,2-Dichloropropane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
2-Butanone	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
2-Hexanone	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
4-Methyl-2-pentanone	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Acetone	UG/KG	46	B	11	U	12	J	140		10	U	11	U
Benzene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Bromodichloromethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Bromoform	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Bromomethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Carbon disulfide	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Carbon tetrachloride	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Chlorobenzene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Chloroethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Chloroform	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Chloromethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Cis-1,3-Dichloropropene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Dibromochloromethane	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Ethylbenzene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Methylene chloride	UG/KG	11	B	12	B	87	B	47	B	9	JB	7	JB
Styrene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Tetrachloroethene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Toluene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Trans-1,3-Dichloropropene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Trichloroethene	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Vinyl chloride	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
Xylenes (Total)	UG/KG	11	U	11	U	13	U	11	U	10	U	11	U
2													
1,2,4-Trichlorobenzene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U

LOCATOR:		BCC-B4		BCC-B5		BCC-B6		BCC-B7		BCD-B1		BCD-B1	
SAMPLE ID:		BCC-B4-1012		BCC-B5-1012		BCC-B6-1012		BCC-B7-1012		BCD-B1-0002		BCD-B1-2527	
COLLECTION DATE:		07/14/94		07/15/94		07/15/94		07/15/94		07/15/94		07/15/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1,2-Dichlorobenzene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
1,3-Dichlorobenzene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
1,4-Dichlorobenzene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2,2'-Oxybis(1-chloropropane)	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2,4,5-Trichlorophenol	UG/KG	900	U	890	U	1000	U	880	U	820	U	870	U
2,4,6-Trichlorophenol	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2,4-Dichlorophenol	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2,4-Dimethylphenol	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2,4-Dinitrophenol	UG/KG	900	U	890	U	1000	U	880	U	820	U	870	U
2,4-Dinitrotoluene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2,6-Dinitrotoluene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2-Chloronaphthalene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2-Chlorophenol	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2-Methylnaphthalene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2-Methylphenol	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
2-Nitroaniline	UG/KG	900	U	890	U	1000	U	880	U	820	U	870	U
2-Nitrophenol	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
3,3'-Dichlorobenzidine	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
3-Nitroaniline	UG/KG	900	U	890	U	1000	U	880	U	820	U	870	U
4,6-Dinitro-2-methylphenol	UG/KG	900	U	890	U	1000	U	880	U	820	U	870	U
4-Bromophenyl phenyl ether	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
4-Chloro-3-methylphenol	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
4-Chloroaniline	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
4-Chlorophenyl phenyl ether	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
4-Methylphenol	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
4-Nitroaniline	UG/KG	900	U	890	U	1000	U	880	U	820	U	870	U
4-Nitrophenol	UG/KG	900	U	890	U	1000	U	880	U	820	U	870	U
Acenaphthene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Acenaphthylene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Anthracene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Benzo(a)anthracene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Benzo(a)pyrene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Benzo(b)fluoranthene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Benzo(g,h,i)perylene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Benzo(k)fluoranthene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Butyl benzyl phthalate	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U

LOCATOR:		BCC-B4		BCC-B5		BCC-B6		BCC-B7		BCD-B1		BCD-B1	
SAMPLE ID:		BCC-B4-1012		BCC-B5-1012		BCC-B6-1012		BCC-B7-1012		BCD-B1-0002		BCD-B1-2527	
COLLECTION DATE:		07/14/94		07/15/94		07/15/94		07/15/94		07/15/94		07/15/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Carbazole	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Chrysene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Di-n-butyl phthalate	UG/KG	52	J	80	J	72	J	160	J	57	J	360	U
Di-n-octyl phthalate	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Dibenzo(a,h)anthracene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Dibenzofuran	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Diethyl phthalate	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Dimethyl phthalate	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Fluoranthene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Fluorene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Hexachlorobenzene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Hexachlorobutadiene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Hexachlorocyclopentadiene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Hexachloroethane	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Indeno(1,2,3-cd)pyrene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Isophorone	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
N-Nitroso-di-n-propylamine	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
N-Nitrosodiphenylamine(1)	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Naphthalene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Nitrobenzene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Pentachlorophenol	UG/KG	900	U	890	U	1000	U	880	U	820	U	870	U
Phenanthrene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Phenol	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
Pyrene	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
bis(2-Chloroethoxy)methane	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
bis(2-Chloroethyl)ether	UG/KG	370	U	370	U	420	U	360	U	340	U	360	U
bis(2-Ethylhexyl)phthalate	UG/KG	180	J	54	J	420	U	87	J	36	J	540	
3													
Antimony	MG/KG	3.40	U*	3.40	*	3.90	U*	3.40	U*	3.10	UN	3.30	UN
Arsenic	MG/KG	1.50	N	1.60	N	3.20	N	8.30	AN	24.40	N*	4.10	N*
Barium	MG/KG	-		-		-		-		-		-	
Beryllium	MG/KG	0.12	U	0.12	U	0.14	U	0.12	U	0.21	B	0.12	U
Cadmium	MG/KG	0.39	U	0.38	U	0.44	U	0.38	U	0.35	U	0.38	U
Chromium	MG/KG	8.30	*	5.70	*	5.40	*	6.20	*	8.50	*	5.70	*
Chromuim, Cr+6	mg/L	0	U	0	U	0	U	0	U	0.02		0	U

	LOCATOR:	BCC-B4		BCC-B5		BCC-B6		BCC-B7		BCD-B1		BCD-B1	
	SAMPLE ID:	BCC-B4-1012		BCC-B5-1012		BCC-B6-1012		BCC-B7-1012		BCD-B1-0002		BCD-B1-2527	
	COLLECTION DATE:	07/14/94		07/15/94		07/15/94		07/15/94		07/15/94		07/15/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Copper	MG/KG	3.20		3.40		3.40		4.60		4.70		4	
Lead	MG/KG	1.50	N	1.30	N	2.40	N	2.50	N	3.90	N*	3.10	N*
Mercury	MG/KG	0.11	U	0.11	U	0.13	U	0.11	U	0.15	*	0.11	U*
Nickel	MG/KG	43.20	*	7.50	*	5.10	U*	6.20	*	17.40		6.20	
Selenium	MG/KG	0.44	UWN	0.44	UWN	0.50	UWN	0.43	UWN	0.40	UW	0.43	U
Silver	MG/KG	0.46	U	0.45	U	0.51	U	0.44	U	0.42	U	0.44	U
Thallium	MG/KG	0.41	U	0.40	UW	0.46	U	0.40	UW	0.37	UWN	0.40	UWN
Zinc	MG/KG	10.20	E	12	E	13.70	E	17.40	E	16	E	19.10	E

LOCATOR:		BCD-B2		BCD-B2		BCE-B1		BCE-B1		BCE-B2		BCE-B2	
SAMPLE ID:		BCD-B2-0002		BCD-B2-0507		BCE-B1-0002		BCE-B1-3032		BCE-B2-0002		BCE-B2-3032	
COLLECTION DATE:		07/15/94		07/15/94		07/12/94		07/12/94		07/12/94		07/12/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1													
1,1,1-Trichloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
1,1,2,2-Tetrachloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
1,1,2-Trichloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
1,1-Dichloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
1,1-Dichloroethene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
1,2-Dichloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
1,2-Dichloroethene(Total)	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
1,2-Dichloropropane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
2-Butanone	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
2-Hexanone	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
4-Methyl-2-pentanone	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Acetone	UG/KG	19		11	U	21	B	30	B	16	B	30	B
Benzene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Bromodichloromethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Bromoform	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Bromomethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Carbon disulfide	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Carbon tetrachloride	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Chlorobenzene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Chloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Chloroform	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Chloromethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Cis-1,3-Dichloropropene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Dibromochloromethane	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Ethylbenzene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Methylene chloride	UG/KG	9	(B)	12	B	8	JB	12	B	7	(B)	16	B
Styrene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Tetrachloroethene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Toluene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Trans-1,3-Dichloropropene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Trichloroethene	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Vinyl chloride	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
Xylenes (Total)	UG/KG	10	U	11	U	11	U	11	U	11	U	11	U
2													
1,2,4-Trichlorobenzene	UG/KG	340	U	-		350	U	360	U	350	U	360	U

LOCATOR:		BCD-B2		BCD-B2		BCE-B1		BCE-B1		BCE-B2		BCE-B2	
SAMPLE ID:		BCD-B2-0002		BCD-B2-0507		BCE-B1-0002		BCE-B1-3032		BCE-B2-0002		BCE-B2-3032	
COLLECTION DATE:		07/15/94		07/15/94		07/12/94		07/12/94		07/12/94		07/12/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1,2-Dichlorobenzene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
1,3-Dichlorobenzene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
1,4-Dichlorobenzene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2,2'-Oxybis(1-chloropropane)	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2,4,5-Trichlorophenol	UG/KG	830	U	-		840	U	880	U	840	U	860	U
2,4,6-Trichlorophenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2,4-Dichlorophenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2,4-Dimethylphenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2,4-Dinitrophenol	UG/KG	830	U	-		840	U	880	U	840	U	860	U
2,4-Dinitrotoluene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2,6-Dinitrotoluene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2-Chloronaphthalene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2-Chlorophenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2-Methylnaphthalene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2-Methylphenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
2-Nitroaniline	UG/KG	830	U	-		840	U	880	U	840	U	860	U
2-Nitrophenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
3,3'-Dichlorobenzidine	UG/KG	340	U	-		350	U	360	U	350	U	360	U
3-Nitroaniline	UG/KG	830	U	-		840	U	880	U	840	U	860	U
4,6-Dinitro-2-methylphenol	UG/KG	830	U	-		840	U	880	U	840	U	860	U
4-Bromophenyl phenyl ether	UG/KG	340	U	-		350	U	360	U	350	U	360	U
4-Chloro-3-methylphenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
4-Chloroaniline	UG/KG	340	U	-		350	U	360	U	350	U	360	U
4-Chlorophenyl phenyl ether	UG/KG	340	U	-		350	U	360	U	350	U	360	U
4-Methylphenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
4-Nitroaniline	UG/KG	830	U	-		840	U	880	U	840	U	860	U
4-Nitrophenol	UG/KG	830	U	-		840	U	880	U	840	U	860	U
Acenaphthene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Acenaphthylene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Anthracene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Benzo(a)anthracene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Benzo(a)pyrene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Benzo(b)fluoranthene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Benzo(g,h,i)perylene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Benzo(k)fluoranthene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Butyl benzyl phthalate	UG/KG	340	U	-		350	U	360	U	350	U	360	U

LOCATOR:		BCD-B2		BCD-B2		BCE-B1		BCE-B1		BCE-B2		BCE-B2	
SAMPLE ID:		BCD-B2-0002		BCD-B2-0507		BCE-B1-0002		BCE-B1-3032		BCE-B2-0002		BCE-B2-3032	
COLLECTION DATE:		07/15/94		07/15/94		07/12/94		07/12/94		07/12/94		07/12/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Carbazole	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Chrysene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Di-n-butyl phthalate	UG/KG	54	()	-		350	U	360	U	350	U	360	U
Di-n-octyl phthalate	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Dibenzo(a,h)anthracene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Dibenzofuran	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Diethyl phthalate	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Dimethyl phthalate	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Fluoranthene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Fluorene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Hexachlorobenzene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Hexachlorobutadiene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Hexachlorocyclopentadiene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Hexachloroethane	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Indeno(1,2,3-cd)pyrene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Isophorone	UG/KG	340	U	-		350	U	360	U	350	U	360	U
N-Nitroso-di-n-propylamine	UG/KG	340	U	-		350	U	360	U	350	U	360	U
N-Nitrosodiphenylamine(1)	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Naphthalene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Nitrobenzene	UG/KG	830	U	-		840	U	880	U	840	U	860	U
Pentachlorophenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Phenanthrene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Phenol	UG/KG	340	U	-		350	U	360	U	350	U	360	U
Pyrene	UG/KG	340	U	-		350	U	360	U	350	U	360	U
bis(2-Chloroethoxy)methane	UG/KG	340	U	-		350	U	360	U	350	U	360	U
bis(2-Chloroethyl)ether	UG/KG	340	U	-		350	U	360	U	350	U	360	U
bis(2-Ethylhexyl)phthalate	UG/KG	340	U	-		350	U	360	U	350	U	360	U
3													
Antimony	MG/KG	3.20	UL	3.20	UN	3.20	UN	3.40	UN	3.20	UL	4.30	*
Arsenic	MG/KG	5	L	6	AN*	5.90	N	4.70	AN	6.50		3.80	N
Barium	MG/KG	-		-		-		-		-		-	
Beryllium	MG/KG	0.17	()	0.13	B	0.30	B	0.12	U	0.22	()	0.12	U
Cadmium	MG/KG	0.35	U	0.36	U	0.36	UN	0.38	UN	0.36	UL	0.37	U
Chromium	MG/KG	17.60		5.80	*	9.90	N	5.10	N	10	L	5	*
Chromuim, Cr+6	mg/L	0.01		0	U	0.02		0	U	0.02		0	U

	LOCATOR:	BCD-B2		BCD-B2		BCE-B1		BCE-B1		BCE-B2		BCE-B2	
	SAMPLE ID:	BCD-B2-0002		BCD-B2-0507		BCE-B1-0002		BCE-B1-3032		BCE-B2-0002		BCE-B2-3032	
	COLLECTION DATE:	07/15/94		07/15/94		07/12/94		07/12/94		07/12/94		07/12/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Copper	MG/KG	8.30		4.60		9.30		3.90		6.20		3.90	
Lead	MG/KG	3.20	B	4.10	AN*	9.10	*	2.70	*	6.90		2.80	N
Mercury	MG/KG	0.17		0.11	U*	0.11	U	0.11	U	0.10	U	0.11	U
Nickel	MG/KG	8.70		7.60		10		7.90		7.90		5.30	*
Selenium	MG/KG	0.41	U	0.42	U	0.41	UWN	0.43	UWN	0.41	UL	0.42	UWN
Silver	MG/KG	0.42	U	0.43	U	0.42	U	0.44	U	0.42	U	0.44	U
Thallium	MG/KG	0.38	UL	0.38	UWN	0.38	U	0.40	UW	0.38	U	0.39	UW
Zinc	MG/KG	65.20		14.80	E	24.10	EN	17.20	EN	26	L	20.20	E

LOCATOR:		BCF-B1		BCF-B1		BCF-B2		BCF-B2		BCF-B3		BCF-B3	
SAMPLE ID:		BCF-B1-0103		BCF-B1-3032		BCF-B2-0103		BCF-B2-3032		BCF-B3-0103		BCF-B3-0507	
COLLECTION DATE:		06/29/94		06/29/94		06/29/94		06/30/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1													
1,1,1-Trichloroethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
1,1,2,2-Tetrachloroethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
1,1,2-Trichloroethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
1,1-Dichloroethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
1,1-Dichloroethene	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
1,2-Dichloroethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
1,2-Dichloroethene(Total)	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
1,2-Dichloropropane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
2-Butanone	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
2-Hexanone	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
4-Methyl-2-pentanone	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Acetone	UG/KG	11	U	10	U	11	U	18	B	45		39	
Benzene	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Bromodichloromethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Bromoform	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Bromomethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Carbon disulfide	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Carbon tetrachloride	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Chlorobenzene	UG/KG	1	J	10	U	11	U	11	U	11	U	11	U
Chloroethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Chloroform	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Chloromethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Cis-1,3-Dichloropropene	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Dibromochloromethane	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Ethylbenzene	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Methylene chloride	UG/KG	11	B	16	B	130	B	5	JB	8	JB	10	(B)
Styrene	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Tetrachloroethene	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Toluene	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Trans-1,3-Dichloropropene	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Trichloroethene	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Vinyl chloride	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
Xylenes (Total)	UG/KG	11	U	10	U	11	U	11	U	11	U	11	U
2													
1,2,4-Trichlorobenzene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U

LOCATOR:		BCF-B1		BCF-B1		BCF-B2		BCF-B2		BCF-B3		BCF-B3	
SAMPLE ID:		BCF-B1-0103		BCF-B1-3032		BCF-B2-0103		BCF-B2-3032		BCF-B3-0103		BCF-B3-0507	
COLLECTION DATE:		06/29/94		06/29/94		06/29/94		06/30/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1,2-Dichlorobenzene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
1,3-Dichlorobenzene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
1,4-Dichlorobenzene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2,2'-Oxybis(1-chloropropane)	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2,4,5-Trichlorophenol	UG/KG	860	U	830	U	840	U	840	U	850	U	830	U
2,4,6-Trichlorophenol	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2,4-Dichlorophenol	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2,4-Dimethylphenol	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2,4-Dinitrophenol	UG/KG	860	U	830	U	840	U	840	U	850	U	830	U
2,4-Dinitrotoluene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2,6-Dinitrotoluene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2-Chloronaphthalene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2-Chlorophenol	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2-Methylnaphthalene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2-Methylphenol	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
2-Nitroaniline	UG/KG	860	U	830	U	840	U	840	U	850	U	830	U
2-Nitrophenol	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
3,3'-Dichlorobenzidine	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
3-Nitroaniline	UG/KG	860	U	830	U	840	U	840	U	850	U	830	U
4,6-Dinitro-2-methylphenol	UG/KG	860	U	830	U	840	U	840	U	850	U	830	U
4-Bromophenyl phenyl ether	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
4-Chloro-3-methylphenol	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
4-Chloroaniline	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
4-Chlorophenyl phenyl ether	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
4-Methylphenol	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
4-Nitroaniline	UG/KG	860	U	830	U	840	U	840	U	850	U	830	U
4-Nitrophenol	UG/KG	860	U	830	U	840	U	840	U	850	U	830	U
Acenaphthene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Acenaphthylene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Anthracene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Benzo(a)anthracene	UG/KG	360	U	340	U	38	J	350	U	68	J	340	U
Benzo(a)pyrene	UG/KG	360	U	340	U	350	U	350	U	69	J	340	U
Benzo(b)fluoranthene	UG/KG	46	XJ	340	U	65	XJ	350	U	130	XJ	340	U
Benzo(g,h,i)perylene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Benzo(k)fluoranthene	UG/KG	47	XJ	340	U	65	XJ	350	U	140	XJ	340	U
Butyl benzyl phthalate	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U

LOCATOR:		BCF-B1		BCF-B1		BCF-B2		BCF-B2		BCF-B3		BCF-B3	
SAMPLE ID:		BCF-B1-0103		BCF-B1-3032		BCF-B2-0103		BCF-B2-3032		BCF-B3-0103		BCF-B3-0507	
COLLECTION DATE:		06/29/94		06/29/94		06/29/94		06/30/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Carbazole	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Chrysene	UG/KG	47	J	340	U	37	J	350	U	73	J	340	U
Di-n-butyl phthalate	UG/KG	360	U	340	U	350	U	350	U	64	J	96	()
Di-n-octyl phthalate	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Dibenzo(a,h)anthracene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Dibenzofuran	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Diethyl phthalate	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Dimethyl phthalate	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Fluoranthene	UG/KG	74	J	340	U	65	J	350	U	150	J	340	U
Fluorene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Hexachlorobenzene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Hexachlorobutadiene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Hexachlorocyclopentadiene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Hexachloroethane	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Indeno(1,2,3-cd)pyrene	UG/KG	360	U	340	U	350	U	350	U	43	J	340	U
Isophorone	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
N-Nitroso-di-n-propylamine	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
N-Nitrosodiphenylamine(1)	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Naphthalene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Nitrobenzene	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Pentachlorophenol	UG/KG	860	U	830	U	840	U	840	U	850	U	830	U
Phenanthrene	UG/KG	120	J	340	U	350	U	350	U	86	J	340	U
Phenol	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
Pyrene	UG/KG	59	J	340	U	53	J	350	U	110	J	340	U
bis(2-Chloroethoxy)methane	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
bis(2-Chloroethyl)ether	UG/KG	360	U	340	U	350	U	350	U	350	U	340	U
bis(2-Ethylhexyl)phthalate	UG/KG	170	JB	83	JB	91	JB	240	JB	50	J	38	()
3													
Antimony	MG/KG	3.30	UN	3.10	UN	3.20	UN	3.20	UN	3.20	U*	3.20	U
Arsenic	MG/KG	4.70	N	4.40	N	5.30	N	4	N	5.70	N	8.10	
Barium	MG/KG	-		-		-		-		-		-	
Beryllium	MG/KG	0.33	B	0.14	B	0.14	B	0.15	B	0.31	B	0.22	()
Cadmium	MG/KG	0.37	UN	0.35	UN	0.36	UN	0.36	UN	0.36	U	0.36	U
Chromium	MG/KG	12.40	N	5.50	N	8.80	N	5.40	N	11.70	*	6.30	
Chromuim, Cr+6	mg/L	0	U	0	U	0.01		0	U	0.06		0	U

	LOCATOR:	BCF-B1		BCF-B1		BCF-B2		BCF-B2		BCF-B3		BCF-B3	
	SAMPLE ID:	BCF-B1-0103		BCF-B1-3032		BCF-B2-0103		BCF-B2-3032		BCF-B3-0103		BCF-B3-0507	
	COLLECTION DATE:	06/29/94		06/29/94		06/29/94		06/30/94		07/14/94		07/14/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Copper	MG/KG	7.40		4.30		5		3.90		7.10		6.60	
Lead	MG/KG	9.70	*	3.40	*	4.70	*	2.80	*	8.40	N	3.40	L
Mercury	MG/KG	0.11	U	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
Nickel	MG/KG	9.30		6.80		7.80		8.70		8.80	*	6	
Selenium	MG/KG	0.42	UWN	0.40	UWN	0.41	UWN	0.41	UWN	0.42	UWN	0.41	UL
Silver	MG/KG	0.43	U	0.41	U	0.42	U	0.42	U	0.43	U	0.42	U
Thallium	MG/KG	0.39	U	0.37	UW	0.38	U	0.38	UW	0.39	U	0.38	U
Zinc	MG/KG	23	EN	15.80	EN	18.40	EN	16.80	EN	28.10	E	18	

		BCF-B3		BCG-B1		BCG-B2		BCG-B4		BCG-B7	
LOCATOR:		BCF-B3		BCG-B1		BCG-B2		BCG-B4		BCG-B7	
SAMPLE ID:		BCF-B3-3032		BCG-B1-0001		BCG-B2-0002		BCG-B4-1012		BCG-B7-1012	
COLLECTION DATE:		07/14/94		06/30/94		07/14/94		07/13/94		07/15/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1											
1,1,1-Trichloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U
1,1,2,2-Tetrachloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U
1,1,2-Trichloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U
1,1-Dichloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U
1,1-Dichloroethene	UG/KG	10	U	11	U	11	U	11	U	11	U
1,2-Dichloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U
1,2-Dichloroethene(Total)	UG/KG	10	U	11	U	11	U	11	U	11	U
1,2-Dichloropropane	UG/KG	10	U	11	U	11	U	11	U	11	U
2-Butanone	UG/KG	10	U	11	U	11	U	11	U	11	U
2-Hexanone	UG/KG	10	U	11	U	11	U	11	U	11	U
4-Methyl-2-pentanone	UG/KG	10	U	11	U	11	U	11	U	11	U
Acetone	UG/KG	10	U	11	U	18		44	B	10	J
Benzene	UG/KG	10	U	11	U	11	U	11	U	11	U
Bromodichloromethane	UG/KG	10	U	11	U	11	U	11	U	11	U
Bromoform	UG/KG	10	U	11	U	11	U	11	U	11	U
Bromomethane	UG/KG	10	U	11	U	11	U	11	U	11	U
Carbon disulfide	UG/KG	10	U	11	U	11	U	11	U	11	U
Carbon tetrachloride	UG/KG	10	U	11	U	11	U	11	U	11	U
Chlorobenzene	UG/KG	10	U	11	U	11	U	11	U	11	U
Chloroethane	UG/KG	10	U	11	U	11	U	11	U	11	U
Chloroform	UG/KG	10	U	11	U	11	U	11	U	11	U
Chloromethane	UG/KG	10	U	11	U	11	U	11	U	11	U
Cis-1,3-Dichloropropene	UG/KG	10	U	11	U	11	U	11	U	11	U
Dibromochloromethane	UG/KG	10	U	11	U	11	U	11	U	11	U
Ethylbenzene	UG/KG	10	U	11	U	11	U	11	U	11	U
Methylene chloride	UG/KG	5	JB	53	B	8	JB	10	JB	13	B
Styrene	UG/KG	10	U	11	U	11	U	11	U	11	U
Tetrachloroethene	UG/KG	10	U	11	U	11	U	11	U	11	U
Toluene	UG/KG	10	U	11	U	11	U	11	U	11	U
Trans-1,3-Dichloropropene	UG/KG	10	U	11	U	11	U	11	U	11	U
Trichloroethene	UG/KG	10	U	11	U	11	U	11	U	11	U
Vinyl chloride	UG/KG	10	U	11	U	11	U	11	U	11	U
Xylenes (Total)	UG/KG	10	U	11	U	11	U	11	U	11	U
2											
1,2,4-Trichlorobenzene	UG/KG	340	U	3800	U	340	U	380	U	360	U

LOCATOR:		BCF-B3		BCG-B1		BCG-B2		BCG-B4		BCG-B7	
SAMPLE ID:		BCF-B3-3032		BCG-B1-0001		BCG-B2-0002		BCG-B4-1012		BCG-B7-1012	
COLLECTION DATE:		07/14/94		06/30/94		07/14/94		07/13/94		07/15/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1,2-Dichlorobenzene	UG/KG	340	U	3800	U	340	U	380	U	360	U
1,3-Dichlorobenzene	UG/KG	340	U	3800	U	340	U	380	U	360	U
1,4-Dichlorobenzene	UG/KG	340	U	3800	U	340	U	380	U	360	U
2,2'-Oxybis(1-chloropropane)	UG/KG	340	U	3800	U	340	U	380	U	360	U
2,4,5-Trichlorophenol	UG/KG	820	U	9100	U	830	U	910	U	870	U
2,4,6-Trichlorophenol	UG/KG	340	U	3800	U	340	U	380	U	360	U
2,4-Dichlorophenol	UG/KG	340	U	3800	U	340	U	380	U	360	U
2,4-Dimethylphenol	UG/KG	340	U	3800	U	340	U	380	U	360	U
2,4-Dinitrophenol	UG/KG	820	U	9100	U	830	U	910	U	870	U
2,4-Dinitrotoluene	UG/KG	340	U	3800	U	340	U	380	U	360	U
2,6-Dinitrotoluene	UG/KG	340	U	3800	U	340	U	380	U	360	U
2-Chloronaphthalene	UG/KG	340	U	3800	U	340	U	380	U	360	U
2-Chlorophenol	UG/KG	340	U	3800	U	340	U	380	U	360	U
2-Methylnaphthalene	UG/KG	340	U	3800	U	340	U	380	U	360	U
2-Methylphenol	UG/KG	340	U	3800	U	340	U	380	U	360	U
2-Nitroaniline	UG/KG	820	U	9100	U	830	U	910	U	870	U
2-Nitrophenol	UG/KG	340	U	3800	U	340	U	380	U	360	U
3,3'-Dichlorobenzidine	UG/KG	340	U	3800	U	340	U	380	U	360	U
3-Nitroaniline	UG/KG	820	U	9100	U	830	U	910	U	870	U
4,6-Dinitro-2-methylphenol	UG/KG	820	U	9100	U	830	U	910	U	870	U
4-Bromophenyl phenyl ether	UG/KG	340	U	3800	U	340	U	380	U	360	U
4-Chloro-3-methylphenol	UG/KG	340	U	3800	U	340	U	380	U	360	U
4-Chloroaniline	UG/KG	340	U	3800	U	340	U	380	U	360	U
4-Chlorophenyl phenyl ether	UG/KG	340	U	3800	U	340	U	380	U	360	U
4-Methylphenol	UG/KG	340	U	3800	U	340	U	380	U	360	U
4-Nitroaniline	UG/KG	820	U	9100	U	830	U	910	U	870	U
4-Nitrophenol	UG/KG	820	U	9100	U	830	U	910	U	870	U
Acenaphthene	UG/KG	340	U	3800	U	340	U	380	U	360	U
Acenaphthylene	UG/KG	340	U	3800	U	340	U	380	U	360	U
Anthracene	UG/KG	340	U	820	J	340	U	380	U	360	U
Benzo(a)anthracene	UG/KG	340	U	5200		340	U	380	U	360	U
Benzo(a)pyrene	UG/KG	340	U	4600		340	U	380	U	360	U
Benzo(b)fluoranthene	UG/KG	340	U	9200		340	U	380	U	360	U
Benzo(g,h,i)perylene	UG/KG	340	U	5000		340	U	380	U	360	U
Benzo(k)fluoranthene	UG/KG	340	U	9700		340	U	380	U	360	U
Butyl benzyl phthalate	UG/KG	340	U	3800	U	340	U	380	U	360	U

LOCATOR:		BCF-B3		BCG-B1		BCG-B2		BCG-B4		BCG-B7	
SAMPLE ID:		BCF-B3-3032		BCG-B1-0001		BCG-B2-0002		BCG-B4-1012		BCG-B7-1012	
COLLECTION DATE:		07/14/94		06/30/94		07/14/94		07/13/94		07/15/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Carbazole	UG/KG	340	U	890	J	340	U	380	U	360	U
Chrysene	UG/KG	340	U	4400		340	U	380	U	360	U
Di-n-butyl phthalate	UG/KG	140	J	3800	U	160	J	140	J	40	J
Di-n-octyl phthalate	UG/KG	340	U	3800	U	340	U	380	U	360	U
Dibenzo(a,h)anthracene	UG/KG	340	U	1100	J	340	U	380	U	360	U
Dibenzofuran	UG/KG	340	U	3800	U	340	U	380	U	360	U
Diethyl phthalate	UG/KG	340	U	3800	U	340	U	380	U	360	U
Dimethyl phthalate	UG/KG	340	U	3800	U	340	U	380	U	360	U
Fluoranthene	UG/KG	340	U	11000		340	U	380	U	360	U
Fluorene	UG/KG	340	U	420	J	340	U	380	U	360	U
Hexachlorobenzene	UG/KG	340	U	3800	U	340	U	380	U	360	U
Hexachlorobutadiene	UG/KG	340	U	3800	U	340	U	380	U	360	U
Hexachlorocyclopentadiene	UG/KG	340	U	3800	U	340	U	380	U	360	U
Hexachloroethane	UG/KG	340	U	3800	U	340	U	380	U	360	U
Indeno(1,2,3-cd)pyrene	UG/KG	340	U	4500		340	U	380	U	360	U
Isophorone	UG/KG	340	U	3800	U	340	U	380	U	360	U
N-Nitroso-di-n-propylamine	UG/KG	340	U	3800	U	340	U	380	U	360	U
N-Nitrosodiphenylamine(1)	UG/KG	340	U	3800	U	340	U	380	U	360	U
Naphthalene	UG/KG	340	U	3800	U	340	U	380	U	360	U
Nitrobenzene	UG/KG	340	U	3800	U	340	U	380	U	360	U
Pentachlorophenol	UG/KG	820	U	9100	U	830	U	910	U	870	U
Phenanthrene	UG/KG	340	U	6100		340	U	380	U	360	U
Phenol	UG/KG	340	U	3800	U	340	U	380	U	360	U
Pyrene	UG/KG	340	U	7500		340	U	380	U	360	U
bis(2-Chloroethoxy)methane	UG/KG	340	U	3800	U	340	U	380	U	360	U
bis(2-Chloroethyl)ether	UG/KG	340	U	3800	U	340	U	380	U	360	U
bis(2-Ethylhexyl)phthalate	UG/KG	53	J	3800	U	47	J	600		84	J
3											
Antimony	MG/KG	3.40	*	3.40	UN	3.30	*	3.50	U*	6	N
Arsenic	MG/KG	7.50	AN	7.70	N	10.10	N	1.70	N	2.50	N*
Barium	MG/KG	-		-		-		-		-	
Beryllium	MG/KG	0.11	U	0.20	B	0.13	B	0.13	U	0.12	U
Cadmium	MG/KG	0.35	U	0.44	BN	0.36	U	0.39	U	0.38	U
Chromium	MG/KG	4.30	*	11.50	N	7	*	4.70	*	2.80	*
Chromuim, Cr+6	mg/L	0	U	0	U	0.01		0	U	0	U

	LOCATOR:	BCF-B3		BCG-B1		BCG-B2		BCG-B4		BCG-B7	
	SAMPLE ID:	BCF-B3-3032		BCG-B1-0001		BCG-B2-0002		BCG-B4-1012		BCG-B7-1012	
	COLLECTION DATE:	07/14/94		06/30/94		07/14/94		07/13/94		07/15/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Copper	MG/KG	4.70		11.10		6.20		2.80	B	1.90	B
Lead	MG/KG	3.10	N	43.80		2.20	N	2.10	N	0.18	UQN*
Mercury	MG/KG	0.10	U	0.11	U	0.10	U	0.15		0.11	U*
Nickel	MG/KG	6.50	*	10.80		8.40	*	13.50	*	4.40	U
Selenium	MG/KG	0.40	UWN	0.44	UWN	0.41	UWN	0.45	UWN	0.43	U
Silver	MG/KG	0.41	U	0.46	U	0.42	U	0.46	U	0.44	U
Thallium	MG/KG	0.37	UW	0.41	U	0.38	UW	0.41	U	0.40	UWN
Zinc	MG/KG	16.10	E	131	EN	17.40	E	9.10	E	9.70	E

	LOCATOR:	BCC		BCC		BCC	
	SAMPLE ID:	BCC-GW1		BCC-GW1F		BCC-GW1RE	
	COLLECTION DATE:	11/08/94		11/08/94		11/08/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
1							
1,1,1-Trichloroethane	UG/L	1	U	-		-	
1,1,2,2-Tetrachloroethane	UG/L	1	U	-		-	
1,1,2-Trichloroethane	UG/L	1	U	-		-	
1,1-Dichloroethane	UG/L	1	U	-		-	
1,1-Dichloroethene	UG/L	1	U	-		-	
1,2-Dibromo-3-chloropropane (D	UG/L	1	U	-		-	
1,2-Dibromoethane (Ethylene di	UG/L	1	U	-		-	
1,2-Dichlorobenzene	UG/L	1	U	-		-	
1,2-Dichloroethane	UG/L	1	U	-		-	
1,2-Dichloroethene(Total)	UG/L	-		-		-	
1,2-Dichloropropane	UG/L	1	U	-		-	
1,3-Dichlorobenzene	UG/L	1	U	-		-	
1,4-Dichlorobenzene	UG/L	1	U	-		-	
2-Butanone	UG/L	5	U	-		-	
2-Hexanone	UG/L	5	U	-		-	
4-Methyl-2-pentanone	UG/L	5	U	-		-	
Acetone	UG/L	5	U	-		-	
Benzene	UG/L	1	U	-		-	
Bromochloromethane	UG/L	1	U	-		-	
Bromodichloromethane	UG/L	1	U	-		-	
Bromoform	UG/L	1	U	-		-	
Bromomethane	UG/L	1	U	-		-	
Carbon disulfide	UG/L	1	U	-		-	
Carbon tetrachloride	UG/L	1	U	-		-	
Chlorobenzene	UG/L	1	U	-		-	
Chloroethane	UG/L	1	U	-		-	
Chloroform	UG/L	1	U	-		-	
Chloromethane	UG/L	1	U	-		-	
Cis-1,2-Dichloroethene	UG/L	1	U	-		-	
Cis-1,3-Dichloropropene	UG/L	1	U	-		-	
Dibromochloromethane	UG/L	1	U	-		-	
Ethylbenzene	UG/L	1	U	-		-	
Methylene chloride	UG/L	0.90	JB	-		-	
Styrene	UG/L	1	U	-		-	
Tetrachloroethene	UG/L	1	U	-		-	

LOCATOR:		BCC		BCC		BCC	
SAMPLE ID:		BCC-GW1		BCC-GW1F		BCC-GW1RE	
COLLECTION DATE:		11/08/94		11/08/94		11/08/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Toluene	UG/L	1	U	-		-	
Trans-1,2-Dichloroethene	UG/L	1	U	-		-	
Trans-1,3-Dichloropropene	UG/L	1	U	-		-	
Trichloroethene	UG/L	1	U	-		-	
Vinyl chloride	UG/L	1	U	-		-	
Xylenes (Total)	UG/L	0.80	J	-		-	
2							
1,2,4-Trichlorobenzene	UG/L	5	U	-		5	U
1,2-Dichlorobenzene	UG/L	-		-		-	
1,3-Dichlorobenzene	UG/L	-		-		-	
1,4-Dichlorobenzene	UG/L	-		-		-	
2,2'-Oxybis(1-chloropropane)	UG/L	5	U	-		5	U
2,4,5-Trichlorophenol	UG/L	20	U	-		20	U
2,4,6-Trichlorophenol	UG/L	5	U	-		5	U
2,4-Dichlorophenol	UG/L	5	U	-		5	U
2,4-Dimethylphenol	UG/L	5	U	-		5	U
2,4-Dinitrophenol	UG/L	20	U	-		20	U
2,4-Dinitrotoluene	UG/L	5	U	-		5	U
2,6-Dinitrotoluene	UG/L	5	U	-		5	U
2-Chloronaphthalene	UG/L	5	U	-		5	U
2-Chlorophenol	UG/L	5	U	-		5	U
2-Methylnaphthalene	UG/L	4	J	-		2	J
2-Methylphenol	UG/L	5	U	-		5	U
2-Nitroaniline	UG/L	20	U	-		20	U
2-Nitrophenol	UG/L	5	U	-		5	U
3,3'-Dichlorobenzidine	UG/L	5	U	-		5	U
3-Nitroaniline	UG/L	20	U	-		20	U
4,6-Dinitro-2-methylphenol	UG/L	20	U	-		20	U
4-Bromophenyl phenyl ether	UG/L	5	U	-		5	U
4-Chloro-3-methylphenol	UG/L	5	U	-		5	U
4-Chloroaniline	UG/L	5	U	-		5	U
4-Chlorophenyl phenyl ether	UG/L	5	U	-		5	U
4-Methylphenol	UG/L	5	U	-		5	U
4-Nitroaniline	UG/L	20	U	-		20	U
4-Nitrophenol	UG/L	20	U	-		20	U

LOCATOR:		BCC		BCC		BCC	
SAMPLE ID:		BCC-GW1		BCC-GW1F		BCC-GW1RE	
COLLECTION DATE:		11/08/94		11/08/94		11/08/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Acenaphthene	UG/L	5	U	-		5	U
Acenaphthylene	UG/L	5	U	-		5	U
Anthracene	UG/L	5	U	-		5	U
Benzo(a)anthracene	UG/L	5	U	-		5	U
Benzo(a)pyrene	UG/L	5	U	-		5	U
Benzo(b)fluoranthene	UG/L	5	U	-		5	U
Benzo(g,h,i)perylene	UG/L	5	U	-		5	U
Benzo(k)fluoranthene	UG/L	5	U	-		5	U
Butyl benzyl phthalate	UG/L	5	U	-		5	U
Carbazole	UG/L	-		-		-	
Chrysene	UG/L	5	U	-		5	U
Di-n-butyl phthalate	UG/L	5	U	-		5	U
Di-n-octyl phthalate	UG/L	5	U	-		5	U
Dibenzo(a,h)anthracene	UG/L	5	U	-		5	U
Dibenzofuran	UG/L	5	U	-		5	U
Diethyl phthalate	UG/L	5	U	-		5	U
Dimethyl phthalate	UG/L	5	U	-		5	U
Fluoranthene	UG/L	5	U	-		5	U
Fluorene	UG/L	5	U	-		5	U
Hexachlorobenzene	UG/L	5	U	-		5	U
Hexachlorobutadiene	UG/L	5	U	-		5	U
Hexachlorocyclopentadiene	UG/L	5	U	-		5	U
Hexachloroethane	UG/L	5	U	-		5	U
Indeno(1,2,3-cd)pyrene	UG/L	5	U	-		5	U
Isophorone	UG/L	5	U	-		5	U
N-Nitroso-di-n-propylamine	UG/L	5	U	-		5	U
N-Nitrosodiphenylamine(1)	UG/L	5	U	-		5	U
Naphthalene	UG/L	5	U	-		5	U
Nitrobenzene	UG/L	5	U	-		5	U
Pentachlorophenol	UG/L	20	U	-		20	U
Phenanthrene	UG/L	5	U	-		5	U
Phenol	UG/L	5	U	-		5	U
Pyrene	UG/L	5	U	-		5	U
bis(2-Chloroethoxy)methane	UG/L	5	U	-		5	U
bis(2-Chloroethyl)ether	UG/L	5	U	-		5	U
bis(2-Ethylhexyl)phthalate	UG/L	5	U	-		2	J

	LOCATOR:	BCC		BCC		BCC	
	SAMPLE ID:	BCC-GW1		BCC-GW1F		BCC-GW1RE	
	COLLECTION DATE:	11/08/94		11/08/94		11/08/94	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
3							
Aluminum	UG/L	-		-		-	
Antimony	UG/L	50.80	U	50.80	U	-	
Arsenic	UG/L	3.80	B	4.80	B	-	
Barium	UG/L	19.30	B	19.20	B	-	
Beryllium	UG/L	0.50	U	0.50	U	-	
Cadmium	UG/L	4.30	U	4.30	U	-	
Calcium	UG/L	-		-		-	
Chromium	UG/L	5.40	U	5.40	U	-	
Cobalt	UG/L	-		-		-	
Copper	UG/L	66.60		7.60	U	-	
Iron	UG/L	-		-		-	
Lead	UG/L	2.30	U	2.30	U	-	
Magnesium	UG/L	-		-		-	
Manganese	UG/L	-		-		-	
Mercury	UG/L	0.20	U	0.20	U	-	
Nickel	UG/L	17.30	U	17.30	U	-	
Potassium	UG/L	-		-		-	
Selenium	UG/L	2.80	U	2.80	UW	-	
Silver	UG/L	3.20	U	3.20	U	-	
Sodium	UG/L	-		-		-	
Thallium	UG/L	3.60	U	3.60	UW	-	
Vanadium	UG/L	-		-		-	
Zinc	UG/L	6.50	B	5.20	U	-	

TCLP SVOCS
BCC-SB2-10'-12'
JSB
7/31/95

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

BCB21012

Lab Name: COMPUCHEM ENV. CORP. Contract: 500639

Lab Code: COMPU Case No.: 29605 SAS No.: SDG No.: 00004

Matrix: (soil/water) WATER Lab Sample ID: 655506

Sample wt/vol: 1000 (g/mL) ML Lab File ID: GH055506A05.D

Level: (low/med) LOW Date Received: 11/10/94

% Moisture: ______ decanted: (Y/N)___ Date Extracted: 11/18/94

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/19/94

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
62-75-9	N-Nitrosodimethylamine	15	U
110-86-1	Pyridine	20	U
123-63-7	Paraldehyde	10	U
97-63-2	Ethylmethacrylate	15	U
109-06-8	2-Picoline	45	U
10595-95-6	Nitrosomethylethylamine	20	U
66-27-3	Methyl Methanesulfonate	20	U
55-18-5	N-Nitrosodiethylamine	15	U
62-50-0	Ethyl Methanesulfonate	20	U
108-95-2	Phenol	15	U
62-53-3	Aniline	15	U
111-44-4	Bis(2-chloroethyl)ether	20	U
76-01-7	Pentachloroethane	10	U
95-57-8	2-Chlorophenol	15	U
541-73-1	1,3-Dichlorobenzene	10	U
100-44-7	Benzyl Chloride	5	U
106-46-7	1,4-Dichlorobenzene	10	U
100-51-6	Benzyl Alcohol	20	U
95-50-1	1,2-Dichlorobenzene	10	U
95-48-7	2-Methylphenol	20	U
39638-32-9	bis(2-Chloroisopropyl)ether	15	U
108-39-4	3-Methylphenol	35	U
106-44-5	4-Methylphenol	35	U
930-55-2	N-Nitrosopyrrolidine	15	U
621-64-7	N-Nitroso-di-N-propylamine	20	U
98-86-2	Acetophenone	20	U
59-89-2	N-Nitrosomorpholine	10	U
636-21-5	o-Toluidine hydrochloride	25	U
67-72-1	Hexachloroethane	10	U
98-95-3	Nitrobenzene	10	U
100-75-4	N-Nitrosopiperidine	10	U
78-59-1	Isophorone	10	U
88-75-5	2-Nitrophenol	5	U

FORM I SV-1

SAMPLE DATA PACKAGE
AMENDED 5/12/95 UGS

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

BCB21012

Lab Name: COMPUCHEM ENV. CORP. Contract: 500639

Lab Code: COMPU Case No.: 29605 SAS No.: SDG No.: 00004

Matrix: (soil/water) WATER Lab Sample ID: 655506

Sample wt/vol: 1000 (g/mL) ML Lab File ID: GH055506A05.D

Level: (low/med) LOW Date Received: 11/10/94

% Moisture: ______ decanted: (Y/N)___ Date Extracted:11/18/94

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/19/94

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
105-67-9	2,4-Dimethylphenol	35	U
108-70-3	1,3,5-Trichlorobenzene	5	U
98-87-3	Benzal chloride	15	U
126-68-1	o,o,o-Triethylphosphorothioa	110	U
65-85-0	Benzoic Acid	95	U
111-91-1	Bis(2-chloroethoxy)methane	15	U
120-83-2	2,4-Dichlorophenol	15	U
120-82-1	1,2,4-Trichlorobenzene	5	U
91-20-3	Naphthalene	5	U
106-47-8	4-Chloroaniline	5	U
87-65-0	2,6-Dichlorophenol	25	U
1888-71-7	Hexachloropropene	20	U
87-68-3	Hexachlorobutadiene	5	U
87-61-6	1,2,3-Trichlorobenzene	5	U
98-07-7	Benzotrichloride	5	U
924-16-3	N-Nitroso-di-n-butylamine	10	U
59-50-7	4-Chloro-3-methylphenol	10	U
94-59-7	Safrole	5	U
91-57-6	2-Methylnaphthalene	10	U
90-12-0	1-Methylnaphthalene	15	U
77-47-4	Hexachlorocyclopentadiene	25	U
95-94-3	1,2,4,5-Tetrachlorobenzene	15	U
634-90-2	1,2,3,5-Tetrachlorobenzene	15	U
88-06-2	2,4,6-Trichlorophenol	25	U
95-95-4	2,4,5-Trichlorophenol	25	U
120-58-1	Isosafrole	10	U
634-66-2	1,2,3,4-Tetrachlorobenzene	10	U
91-58-7	2-Chloronaphthalene	15	U
90-13-1	1-Chloronaphthalene	25	U
88-74-4	2-Nitroaniline	20	U
130-15-4	1,4-Napthoquinone	35	U
131-11-3	Dimethylphthalate	10	U
99-65-0	1,3-Dinitrobenzene	15	U

SAMPLE DATA PACKAGE
AMENDED 5/12/95 VCA

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

BCB21012

Lab Name: COMPUCHEM ENV. CORP. Contract: 500639

Lab Code: COMPU Case No.: 29605 SAS No.: SDG No.: 00004

Matrix: (soil/water) WATER Lab Sample ID: 655506

Sample wt/vol: 1000 (g/mL) ML Lab File ID: GH055506A05.D

Level: (low/med) LOW Date Received: 11/10/94

% Moisture: ______ decanted: (Y/N)___ Date Extracted:11/18/94

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/19/94

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
606-20-2	2,6-Dinitrotoluene	15	U
208-96-8	Acenaphthylene	10	U
99-09-2	3-Nitroaniline	30	U
83-32-9	Acenaphthene	10	U
51-28-5	2,4-Dinitrophenol	75	U
100-02-7	4-Nitrophenol	45	U
608-93-5	Pentachlorobenzene	10	U
121-14-2	2,4-Dinitrotoluene	10	U
132-64-9	Dibenzofuran	10	U
91-59-8	2-Naphthylamine	20	U
58-90-2	2,3,4,6-Tetrachlorophenol	35	U
134-32-7	1-Naphthylamine	35	U
84-66-2	Diethylphthalate	15	U
297-97-2	Zinophos	15	U
7005-72-3	4-Chlorophenyl-phenylether	10	U
99-55-8	5-Nitro-o-toluidine	30	U
86-73-7	Fluorene	10	U
100-01-6	4-Nitroaniline	35	U
534-52-1	4,6-Dinitro-2-methylphenol	45	U
86-30-6	N-Nitrosodiphenylamine (1)	30	U
122-39-4	Diphenylamine	30	U
122-66-7	1,2-Diphenylhydrazine	15	U
99-35-4	1,3,5-Trinitrobenzene	45	U
2303-16-4	Diallate (trans isomer)	20	U
62-44-2	Phenacetin	20	U
2303-16-4	Diallate (cis isomer)	20	U
101-55-3	4-Bromophenyl-phenylether	20	U
118-74-1	Hexachlorobenzene	15	U
60-51-5	Dimethoate	15	U
92-67-1	4-Aminobiphenyl	15	U
87-86-5	Pentachlorophenol	10	U
23950-58-5	Pronamide	55	U
82-68-8	Pentachloronitrobenzene	15	U
		15	U

page 3 of 4 FORM I SV-3

SAMPLE DATA PACKAGE
AMENDED 5/12/95 UOB

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

BCB21012

Lab Name: COMPUCHEM ENV. CORP. Contract: 500639

Lab Code: COMPU Case No.: 29605 SAS No.: SDG No.: 00004

Matrix: (soil/water) WATER Lab Sample ID: 655506

Sample wt/vol: 1000 (g/mL) ML Lab File ID: GH055506A05.D

Level: (low/med) LOW Date Received: 11/10/94

% Moisture: ______ decanted: (Y/N)___ Date Extracted:11/18/94

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/19/94

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
85-01-8	Phenanthrene	15	U
120-12-7	Anthracene	15	U
84-74-2	Di-n-butylphthalate	15	U
56-57-5	4-Nitroquinoline-1-oxide	75	U
91-80-5	Methapyrilene	30	U
6055-19-2	Cyclophosphamide	20	U
465-73-6	Isodrin	15	U
206-44-0	Fluoranthene	20	U
92-87-5	Benzidine	25	U
129-00-0	Pyrene	10	U
140-57-8	Aramite	20	U
60-11-7	p-Dimethylaminoazobenzene	10	U
510-15-6	Chlorobenzilate	10	U
52-85-7	Famfur	65	U
85-68-7	Butylbenzylphthalate	10	U
119-93-7	3,3'-Dimethylbenzidine	100	U
53-96-3	2-Acetylamino fluorene	10	U
119-90-4	3,3'-Dimethoxybenzidine	20	U
117-81-7	bis(2-ethylhexyl)Phthalate	10	U
101-14-4	4,4'-Methylene-bis(2-chloroa	15	U
91-94-1	3,3'-Dichlorobenzidine	10	U
56-55-3	Benzo(a)Anthracene	10	U
218-01-9	Chrysene	15	U
117-84-0	Di-n-octylphthalate	10	U
57-97-6	7,12-Dimethylbenz(a)anthrace	10	U
205-99-2	Benzo(b)fluoranthene	10	U
207-08-9	Benzo(k)fluoranthene	20	U
50-32-8	Benzo(a)pyrene	5	U
56-49-5	3-Methylcholanthrene	5	U
224-42-0	Dibenzo(a,j)acridine	10	U
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U
53-70-3	Dibenzo(a,h)anthracene	10	U
191-24-2	Benzo(g,h,i)perylene	10	U

SAMPLE DATA PACKAGE
AMENDED 5/12/95 CKW

APPENDIX F: DATA VALIDATION SUMMARIES AND LABORATORY CHAIN OF CUSTODIES

DATA VALIDATION FORM FOR VOLATILES
8240

Sample #	Continuing Calibration Compounds with %D≤25	Blanks FORM I & IV VOA	Surrogate Recovery FORM II VOA	Matrix spike/ Matrix spike Duplicates FORM III VOA 1&2	Internal Standards FORM VII VOA
	Acetone 1,1-Di-cl-ethane 1,2 Di-cl propene 4-Methyl-2-Pentanone 2-Hexanone	Qualify hits in samples "B"if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: H6	Check number of surrogates out: ✓ Verify blanks have no surrogates out: ✓ Qualifier: Action:	Verify that spikes are within limits: OK	Internal standard area counts must not exceed upper or lower limits: ✓ Retention time within +/- 30 sec: ✓
	Acetone 1,1-Di-Cl-ethene 2-Butanone	Qualify hits in samples "B"if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: D6	Check number of surrogates out: ✓ Verify blanks have no surrogates out: ✓ Qualifier: Action:	Verify that spikes are within limits: OK	Internal standard area counts must not exceed upper or lower limits: ✓ Retention time within +/- 30 sec: ✓
		Qualify hits in samples "B"if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #:	Check number of surrogates out: Verify blanks have no surrogates out: Qualifier: Action:	Verify that spikes are within limits:	Internal standard area counts must not exceed upper or lower limits: Retention time within +/- 30 sec:
		Qualify hits in samples "B"if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #:	Check number of surrogates out: Verify blanks have no surrogates out: Qualifier: Action:	Verify that spikes are within limits:	Internal standard area counts must not exceed upper or lower limits: Retention time within +/- 30 sec:

SITE NAME:

VALIDATED BY:

SAMPLE DELIVERY GROUP

DATA SUMMARY FORM: B N A S -- 1

SOIL SAMPLES
($\mu g/Kg$)

is: : Kellogg

Sampling Date: ________

To calculate sample quantitation limit:
(CRQL * Dilution Factor) / ((1 - % moisture)/100)

Sample No.	BCA-B1-0001	BCB-B4-0507	BCC-B2-1012	BCD-B2-0002	BCE-B2-0002	BCF-B3-0507			
Dilution Factor									
% Moisture									
Location									
COMPOUND									
Phenol									
bis(2-Chloroethyl)ether									
2-Chlorophenol									
1,3-Dichlorobenzene									
1,4-Dichlorobenzene									
1,2-Dichlorobenzene									
2-Methylphenol									
bis(2-Chloroisopropyl)ether									
4-Methylphenol									
N-Nitroso-di-n-propylamine									
Hexachloroethane									
Nitrobenzene									
Isophorone									
2-Nitrophenol									
2,4-Dimethylphenol									
bis(2-Chloroethoxy)methane									
2,4-Dichlorophenol									
1,2,4-Trichlorobenzene									
Naphthalene	170 ()								
4-Chloroaniline									

, = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/92

Dh... SUM..... FC B 8 2

SOIL SAMPLES
(µg/Kg)

...n ...: ______________

...: ________ Sampling Date(s): ________

To calculate sample quantitation limit:
(CRQL * Dilution Factor) / ((100 - % moisture)/100)

COMPOUND																		
Sample No.																		
Dilution Factor																		
% Moisture																		
Location																		
Hexachlorobutadiene																		
4-Chloro-3-methylphenol																		
2-Methylnaphthalene	180	( )																
Hexachlorocyclopentadiene																		
2,4,6-Trichlorophenol																		
2,4,5-Trichlorophenol																		
2-Chloronaphthalene																		
2-Nitroaniline																		
Dimethylphthalate																		
Acenaphthylene	330	( )																
2,6-Dinitrotoluene																		
3-Nitroaniline																		
Acenaphthene	340	( )																
2,4-Dinitrophenol																		
4-Nitrophenol																		
Dibenzofuran	270	( )																
2,4-Dinitrotoluene																		
Diethylphthalate																		
4-Chlorophenyl-phenylether																		
Fluorene	520																	
4-Nitroaniline																		
4,6-Dinitro-2methylphenol																		

...L = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/92

DATA SUMMARY FORM: B N A S _ 3

SOIL SAMPLES
(µg/Kg)

Sampling Date(s): ______

To calculate sample quantitation limit:
(CRQL * Dilution Factor) / ((100 - % moisture)/100)

Sample No. / Dilution Factor / % Moisture / Location																		
COMPOUND																		
N-Nitrosodiphenylamine																		
4-Bromophenyl-phenylether																		
Hexachlorobenzene																		
Pentachlorophenol																		
Phenanthrene	5400	E																
Anthracene	920																	
Carbazole	220										96	()						
Di-n-butylphthalate	93	()					54	()										
Fluoranthene	2300	E																
Pyrene	6500	E																
Butylbenzylphthalate																		
3,3'-Dichlorobenzidine																		
Benzo(a)anthracene	4900																	
Chrysene	4300										38	()						
bis(2-Ethylhexyl)phthalate	280	(B)																
Di-n-octylphthalate																		
Benzo(b)fluoranthene	9800	E																
Benzo(k)fluoranthene	11000	E																
Benzo(a)pyrene	4600	E																
Indeno(1,2,3-cd)pyrene	2400																	
Dibenz(a,h)anthracene	510																	
Benzo(g,h,i)perylene	2300																	

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/92

= Contract Required Quantitation Limit

DATA VALIDATION FORM FOR SEMI-VOLATILES
CLP

Sample #	Holding Times	Instrument Performance Check	Initial Calibration	Initial Calibration Compounds With %RSD≤30	Continuing Calibration
BCA-B1-0001 Matrix	Sample date: Date Received: 7-1-94 Extraction Date: 7-8-94 Analyzed: 7-12-94 Holding time: Instrument #: [illegible]	Date: [illegible] Time: 1158 Sample analyzed: 1551	Date: 2-15-94 Instrument: 08 Time: 1308 RRF≥ 0.05: — Avg RRF ≥ 0.05: %RSD≤30: —	4-Cl-aniline	Verify RRF≥.05 ✓ Qualify R or L if not: %D≤25: Qualify J or UJ if not: Time: 1213 7-12-94 Instrument:
BCB-B4-[illegible] Matrix	Sample date: Date Received: 7-14-94 Extraction Date: 7-18-94 Analyzed: 7-20-94 Holding time: Instrument #: HO7	Date: 7-20-94 Time: 1513 Sample analyzed: 933	Date: 6-20-94 Instrument: 07 Time: 2153 RRF≥ 0.05: — Avg RRF ≥ 0.05: %RSD≤30:	NONE	Verify RRF≥.05 Qualify R or L if not: %D≤25: Qualify J or UJ if not: Time: [illegible] 7-20-94 Instrument:
[illegible]-B2-1012 Matrix	Sample date: Date Received: 7-16-94 Extraction Date: 7-22-94 Analyzed: 8-15-94 Holding time: Instrument #: B08	Date: 7-28-94 Time: 0005 Sample analyzed: 0625	Date: 2-15-94 Instrument: 08 Time: 1808 RRF≥ 0.05: — Avg RRF ≥ 0.05: %RSD≤30:	4-Cl-aniline	Verify RRF≥.05 — Qualify R or L if not: %D≤25: Qualify J or UJ if not: Time: 1447 8-15-94 Instrument: 08
BCD-B2-0002 Matrix	Sample date: Date Received: 7-18-94 Extraction Date: 7-23-94 Analyzed: 7-30-94 Holding time: Instrument #: 08	Date: 7-30-94 Time: 1248 Sample analyzed: 1308	Date: 2-15-94 Instrument: 08 Time: 1808 RRF≥ 0.05: — Avg RRF ≥ 0.05: %RSD≤30: —	4-Cl-aniline	Verify RRF≥.05 Qualify R or L if not: %D≤25: Qualify J or UJ if not: Time: 1[illegible] 7-30-94 Instrument: 08

SITE NAME:
VALIDATED BY:
SAMPLE DELIVERY GROUP

43 / NONE   81 / bis(2-ethylhexyl)phthalate .38   53 / None   58 / NONE

DATA VALIDATION FORM FOR SEMI-VOLATILES
CLP

Sample #	Continuing Calibration Compounds with %D≤25	Blanks	Surrogate Recovery	Matrix spike/ Matrix spike Duplicates	Internal Standards
	4-Chloroaniline 4-Nitrophenol 4,6-Dinitro-2-methylphenol [illegible]	Qualify hits in samples "B"if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: 81	Check number of surrogates out: Verify blanks have no surrogates out: Qualifier:	Verify that spikes are within limits: RPD 0 of 11 out SR 2 of 22 out 4-Cl-3-methylphenol H 2,4-Dinitrotoluene H	Internal standard area counts must not exceed upper or lower limits: Retention time within +/- 30 sec:
	None	Qualify hits in samples "B"if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: 43	Check number of surrogates out: Verify blanks have no surrogates out: Qualifier:	Verify that spikes are within limits: RPD 0 of 11 out SR 2 of 22 out 4-Cl-3-methylphenol H 2,4-Dinitrotoluene H	Internal standard area counts must not exceed upper or lower limits: Retention time within +/- 30 sec:
	4-Chloroaniline 3-Nitroaniline 2,4-Dinitrophenol see list	Qualify hits in samples "B"if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: 53	Check number of surrogates out: Verify blanks have no surrogates out: Qualifier:	Verify that spikes are within limits: RPD 1 of 11 out SR 4 of 22 out all High	Internal standard area counts must not exceed upper or lower limits: Retention time within +/- 30 sec:
	3-Nitroaniline	Qualify hits in samples "B"if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: 5	Check number of surrogates out: Verify blanks have no surrogates out: Qualifier:	Verify that spikes are within limits: RPD 0 of 11 out SR 3 of 22 out High	Internal standard area counts must not exceed upper or lower limits: Retention time within +/- 30 sec:

SITE NAME:

VALIDATED BY:

SAMPLE DELIVERY GROUP

DATA VALIDATION FORM FOR SEMI-VOLATILES
CLP

Sample #	Holding Times	Instrument Performance Check	Initial Calibration	Initial Calibration Compounds With %RSD≤30	Continuing Calibration
BCE-B3-0002 Matrix	Sample date: Date Received: 7-19-94 Extraction Date: 7-18-94 Analyzed: 7-20-94 Holding time: Instrument # : A07	Date: 7-20-94 Time: 1515 Sample analyzed: 2351	Date: 6-20-94 Instrument: 07 Time: 2153 RRF≥ 0.05: – Avg RRF ≥ 0.05: %RSD≤30:	[illegible]	Verify RRF≥.05 Qualify R or L if not: %D≤25: Qualify J or UJ if not: Time: 1531 7-20-94 Instrument:
BCF-B3-0507 Matrix	Sample date: Date Received: 7-15-94 Extraction Date: 7-22-94 Analyzed: 7-28-94 Holding time: Instrument # : C08	Date: 7-28-94 Time: 0005 Sample analyzed: 0236	Date: 2-15-94 Instrument: 08 Time: 1808 RRF≥ 0.05: – Avg RRF ≥ 0.05: – %RSD≤30:	4-Cl-aniline	Verify RRF≥.05 Qualify R or L if not: %D≤25: Qualify J or UJ if not: Time: 0036 7-28-94 Instrument:
Matrix	Sample date: Date Received: Extraction Date: Analyzed: Holding time: Instrument # :	Date: Time: Sample analyzed:	Date: Instrument: Time: RRF≥ 0.05: Avg RRF ≥ 0.05: %RSD≤30:		Verify RRF≥.05 Qualify R or L if not: %D≤25: Qualify J or UJ if not: Time: Instrument:
Matrix	Sample date: Date Received: Extraction Date: Analyzed: Holding time: Instrument # :	Date: Time: Sample analyzed:	Date: Instrument: Time: RRF≥ 0.05: Avg RRF ≥ 0.05: %RSD≤30:		Verify RRF≥.05 Qualify R or L if not: %D≤25: Qualify J or UJ if not: Time: Instrument:

SITE NAME:
VALIDATED BY:
SAMPLE DELIVERY GROUP

DATA VALIDATION FORM FOR SEMI-VOLATILES
CLP

Sample #	Continuing Calibration Compounds with %D≤25	Blanks	Surrogate Recovery	Matrix spike/ Matrix spike Duplicates	Internal Standards
	None	Qualify hits in samples "B" if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: 43	Check number of surrogates out: ✓ Verify blanks have no surrogates out: ✓ Qualifier:	Verify that spikes are within limits: RPD 0 of 11 out SR 2 of 22 out [illegible]	Internal standard area counts must not exceed upper or lower limits: ✓ Retention time within +/- 30 sec: ✓
	4-Chloroaniline Hexachlorocyclopentadiene 3-Nitroaniline 2,4-Dinitrophenol 4-Nitroaniline See [illegible]	Qualify hits in samples "B" if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: 53	Check number of surrogates out: ✓ Verify blanks have no surrogates out: ✓ Qualifier:	Verify that spikes are within limits: RPD 1 of 11 out SR 4 of 22 out	Internal standard area counts must not exceed upper or lower limits: ✓ Retention time within +/- 30 sec: ✓
		Qualify hits in samples "B" if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #:	Check number of surrogates out: Verify blanks have no surrogates out: Qualifier:	Verify that spikes are within limits: RPD of out SR of out	Internal standard area counts must not exceed upper or lower limits: Retention time within +/- 30 sec:
		Qualify hits in samples "B" if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #:	Check number of surrogates out: Verify blanks have no surrogates out: Qualifier:	Verify that spikes are within limits: RPD of out SR of out	Internal standard area counts must not exceed upper or lower limits: Retention time within +/- 30 sec:

SITE NAME:

VALIDATED BY:

SAMPLE DELIVERY GROUP

Page 1 or 2

COMPUCHEM
ENVIRONMENTAL
CORPORATION
3306 Chapel Hill/Nelson Highway
Research Triangle Park, NC 27709
1-800-833-5097

CHAIN-OF-CUSTODY RECORD

№ 2479

Ship to: Compuchem

Carrier: FEDEX Airbill No.: 1567893294

Project Name: EARTH TECH 110th FG MIANG, BATTLE CREEK

Sampler Name:

Sampler Signature: J. Briegel

Field Point-of-Contact: J. Briegel

Telephone No: (615) 483-9404

Sampling for project complete? Y or (N) (See Note 1.)

Project-specific (PS) or Batch (B) QC:

Box #1 1. Surface Water 2. Ground Water 3. Leachate 4. Rinsate 5. Soil/Sediment/Sludge 6. Trip Blank 7. Oil 8. Waste 9. Other: ______

Box #2: A. HCl B. HNO_3 C. $NaHSO_4$ D. $Na_2S_2O_3$ E. Ice Only O. Other: ______ N. Not Preserved

Box #3: F. Filtered (U. Unfiltered)

Box #4: C. CLP 3/90 S. SW-846 W. CWA 600-series L. Low Conc. CLP R. Radiological T. TCLP O. Other

Box #5: H - High M - Medium L - Low

Sample ID (Organics: 9 characters max, Inorganics: 6 characters; see Note 2)	Date: Year: 19 94	Time	Box #1 Matrix	Box #2 Preservative	Box #3 Filtered/Unfiltered	Box #4 Method	Box #5 Expect. Conc.	No. of Bottles	Use for Lab QC (MS or DUP)	VOA-GC/MS	SV-GC/MS	Pest/PCB-GC	Herb-GC	VOA-GC	Metals PP LIST	Mercury	Cyanides	Radiologicals	TOC/TOX	O&G/TPH	Phenols	Other	Remarks/Comments
BCER4	6/29	15:30	4	A	U	C	L	2		✓													622 745
BCER4	6/29	15:30	4	E	U	C	L	2			✓												749
BCER4	6/29	15:30	4	B	U	C	L	2							✓								755
BCFB10103	6/29	11:17	5	E		C	L	2		✓	✓				✓								763 622 788
BCFB13032	6/29	13:15	5	E		C	L	2		✓	✓				✓								772 622 799
BCFB20103	/	:	5	E		C	L	2		✓	✓				✓								770 622 797
BCFB23032	/	:	5	E		C	L	2		✓	✓				✓				622 778			800	note: client did not
BCAB100001	6/30	0800	5	E		C	M	2		✓	✓				✓				781			802	relinquish chain of
~~BCAB~~	~~/~~	~~:~~	~~5~~	~~E~~		~~C~~													622 784				custody
BCGB100001	6/30	0815	5	E		C	M	2														803	LA Randon 7/1/1994 8:55am

7/1/95

Client's Special Instructions:

Lab: Received In Good Condition? (Y) or (N) Y LR 7/1/94

Describe Problems, If Any:

#1 Relinquished By: (Sig)	Date:	#2 Relinquished By: (Sig)	Date:	#3 Relinquished By: (Sig)	Date:	Sample storage time requested? ___ (in days, see Note 3)
Company Name:	Time:	Company Name:	Time:	Company Name:	Time:	
#1 Received By: (Sig) Lance Randon	Date: 7/1/94	#2 Received By (Sig)	Date:	#3 Received By: (Sig)	Date:	DESTROY or RETURN data after five years of archival? (Circle choice, see Note 4)
Company Name: Compuchem	Time: 8:55am	Company Name:	Time:	Company Name:	Time:	

Note (1): If "N" lab will hold samples to await remainder of project-maximizing batch size and minimizing QC ratio; if "Y" lab will begin processing batches now. Note (2): If CLP Inorganics diskette required, ID limited to maximum of six characters. Note (3): Samples stored 60 days after data report mailed at no extra charge. Note (4): All lab copies of data destroyed after five years unless client requests and pays for return of copies; annual storage fee billed in January of year six.

2 of 2

№ 2484

COMPUCHEM
ENVIRONMENTAL
CORPORATION

3306 Chapel Hill/Nelson Highway
Research Triangle Park, NC 27709

1-800-833-5097

CHAIN-OF-CUSTODY RECORD

Ship to: Compuchem

Carrier: Fedex Airbill No.: 1567893294

Project Name: ~~EARTH TECH~~ 110 FG, MIANG

Sampler Name: J S Briegel

Sampler Signature: J S Briegel

Field Point-of-Contact: J. Briegel

Telephone No: (615) 483-9484

Sampling for project complete? Y or N (See Note 1.)

Project-specific (PS) or Batch (B) QC: ____

Box #1: 1. Surface Water 2. Ground Water 3. Leachate 4. Rinsate 5. Soil/Sediment/Sludge 6. Trip Blank 7. Oil 8. Waste 9. Other: ____

Box #2: A. HCl B. HNO_3 C. $NaHSO_4$ D. $Na_2S_2O_3$ E. Ice Only O. Other: ____ N. Not Preserved

Box #3: F. Filtered U. Unfiltered

Box #4: C. CLP 3/90 S. SW-846 W. CWA 600-series L. Low Conc. CLP R. Radiological T. TCLP O. Other

Box #5: H - High M - Medium L - Low

Sample ID (Organics: 9 characters max, Inorganics: 6 characters; see Note 2)	Date: Year: 19 94	Time	Box #1 Matrix	Box #2 Preservative	Box #3 Filtered/Unfiltered	Box #4 Method	Box #5 Expect. Conc.	No. of Bottles	Use for Lab QC (MS or DUP)	Organics Analysis: VOA-GC/MS	SV-GC/MS	Pest/PCB-GC	Herb-GC	VOA-GC	Inorganics: Metals PP list	Mercury	Cyanides	Other: Radiologicals	TOC/TOX	O&G/TPH	Phenols	Other	Remarks/Comments
BCAB1 0507 1012	6/30	09:50	5	~~4~~ E	-	C	M	2		✓	✓				✓								
BCAB12527	6/30	11:27	5	~~4~~ E	-	C	M	2		✓	✓				✓								622777
	/	:																					801
	/	:																					771
	/	:																					798
	/	:																					
	/	:																					
	/	:																					
	/	:																					

Client's Special Instructions:

Lab: Received in Good Condition? Y or N

Describe Problems, If Any:

#1 Relinquished By: (Sig.) JS Briegel — Date: 6/30/94 — Time: 1530

Company Name: Earth Tech

#1 Received By: (Sig.) Lance Rayden — Date: 7/1/94 — Time: 8:55am

Company Name: Compuchem

#2 Relinquished By: (Sig.) — Date: — Time:

Company Name:

#2 Received By (Sig.) — Date: — Time:

Company Name:

#3 Relinquished By: (Sig.) — Date: — Time:

Company Name:

#3 Received By: (Sig.) — Date: — Time:

Company Name:

Sample storage time requested? ____ (in days, see Note 3)

DESTROY or RETURN data after five years of archival? (Circle choice, see Note 4)

Note (1): If "N" lab will hold samples to [redacted]inder [redacted]-maxi[redacted]tch siz[redacted]inimizing QC ratio; if "Y" lab will begin processing batches now. Note (2): If CLP inorganics diskette required, ID limited to maximum of six characters [redacted] ... days after date report mailed at no extra charge. Note (4): All lab copies [redacted]five ye[redacted]s clien[redacted] and [redacted]eturn [redacted] annual storage fee billed in January of year six

The Earth Technology Corporation
Analytical Laboratories
5702 Bolsa Ave.
Huntington Beach, Ca. 92649
(714) 892-2565 FAX (714) 890-4032

Chain of Custody Record

Lab job no.:
Date 7/15/94
Page 1 of

Client 110TH FG, MIANG; BATTLE CREEK, MI
Address EARTH TECH
Project Name / Number 94-8901-05
Contract / Purchase Order / Quote

Project Manager J. BRIEGEL
Telephone No. (615)483-9404
Fax. No. (615)481-3834
Samplers: (Signature) [signature]

Laboratory Sample Number	Field Sample Number	Location	Date	Time	Sample Type	Type/Size of Container	Preservation Temp.	Preservation Chemical	No. of Containers	VOA GC/MS	SV GC/MS	PP METALS					Remarks		
	BCC-B1-0002		7/14	1300	SOIL	1-STAINLESS STEEL 1-8OZ AMBER		—	2	✓	✓	✓					626123	626133	626143
	BCC-B1-1012		7/14	1323	SOIL	↓		—	2	✓	✓	✓					124	134	144
	BCC-B2-0002		7/14	1425	SOIL	↓		—	2	✓	✓	✓					125	135	145
	BCC-B2-0507	BCC 7/15/94	7/14	1503	SOIL	↓		—	2	✓	✓	✓					126	136	146
	BCC-B2-1012		7/14	1515	SOIL	↓		—	2	✓	✓	✓					127	137	147
	BCC-B3-0002		7/14	1610	SOIL	↓		—	2	✓	✓	✓					128	138	148
	BCC-B3-1416		7/14	1700	SOIL	↓		—	2	✓	✓	✓					129	139	149
	BCC-B4-0002		7/14	1720	SOIL	↓		—	2	✓	✓	✓					130	140	150
	BCC-B4-1012		7/14	1735	SOIL	↓		—	2	✓	✓	✓					131	141	151
	BCC-B4-102		7/14	1795	SOIL	↓		—	2	✓	✓	✓					132	142	152

Remarks: (-)'s DROPPED FROM ID'S 07/16/94

Relinquished by:
Signature
Printed
Company
Reason
Date
Time

Received by:
Signature
Printed
Company
Reason

Relinquished by:
Signature
Printed
Company
Reason
Date
Time

Received by:
Signature M. Stevens
Printed M. STEVENS
Company CompuChem
Reason

Method of Shipment:
Shipment No.
Special Instructions:

Comments: Client did not Relinquish Samples. M.S 7/16/94
Deleted all dash from ID's.

After analysis, samples are to be:
- [ ] Disposed of (additional fee)
- [ ] Stored (90 days max)
- [ ] Stored over 90 days (additional fee)
- [ ] Returned to customer

F1000

The Earth Technology Corporation
Analytical Laboratories
5702 Bolsa Ave.
Huntington Beach, Ca. 92649
(714) 892-2565 FAX (714) 890-4032

Chain of Custody Record

Lab job no.:
Date 7/14/94
Page 1 of 1

Client 110TH FG, MIANG; BATTLE CREEK, MI
Address EARTH TECH
Project Name / Number 94-8901-05
Contract / Purchase Order / Quote
Project Manager J. BRIEGEL
Telephone No. (615) 483-9404
Fax. No. (615) 481-3834
Samplers: (Signature)

Laboratory Sample Number	Field Sample Number	Location	Date	Time	Sample Type	Type/Size of Container	Preservation Temp.	Preservation Chemical	No. of Containers	VOA GC/MS	SV GC/MS	PP METALS				Remarks
	BCF-B3-0103		7/14	0827	SOIL	1-STAINLESS STEEL LINER 1-8oz AMBER		—		✓	✓	✓				625807 813. 814. 808 815. 816. 809 817. 818. 810 819.
	BCF-B3-0507		7/14	0835	SOIL			—		✓	✓	✓				820. 811 821.
	BCF-B3-3032		7/14	0902	SOIL			—		✓	✓	✓				822. 812
	BCG-B2-0002		7/14	0947	SOIL			—		✓	✓	✓				823. 824.
	BCA-B2-0002		7/14	1005	SOIL			—		✓	✓	✓				
	BCA-B2-2527		7/14	1022	SOIL			—		✓	✓	✓				

Note: 9 Characters dashes dropped from I.D. on 7/15/94 8:45am

SAMPLES REC'D IN GOOD CONDITION
7/15/94 8:45am

Relinquished by:	Date	Received by:	Relinquished by:	Date	Received by:
Signature	7/14	Signature	Signature		Signature
Printed EARTH TECH		Printed Lance Rajrden	Printed		Printed
Company SAH SMITH	Time 1500	Company Compuchem	Company	Time	Company
Reason SHIPPING		Reason 7/15/94 8:45am	Reason		Reason

Method of Shipment: FED EX
AIRBILL NO. ~~Shipment No:~~ 9569800726
Special Instructions:

Comments: CLP 3/90; SAMPLING NOT COMPLETE

After analysis, samples are to be:
- [ ] Disposed of (additional fee)
- [ ] Stored (90 days max)
- [ ] Stored over 90 days (additional fee)
- [ ] Returned to customer

F1000

The Earth Technology Corporation

Analytical Laboratories
5702 Bolsa Ave.
Huntington Beach, Ca. 92649
(714) 892-2565 FAX (714) 890-4032

Chain of Custody Record

Lab job no.:
Date 7/13/94
Page 2 of 2

Client 110TH FG, MIANG; BATTLE CREEK, MI
Address EARTH TECH
Project Name / Number 94-8901-05
Contract / Purchase Order / Quote

Project Manager J. BRIEGEL
Telephone No. (615) 483-9404
Fax. No. (615) 481-3834
Samplers: (Signature) Sam S

Laboratory Sample Number	Field Sample Number	Location	Date	Time	Sample Type	Type/Size of Container	Preservation Temp.	Preservation Chemical	No. of Containers	VOA-GC/MS	SV-GC/MS	PP METALS				Remarks
	BCB-BI-0002		7/13	1400	SOIL	1-STAINLESS STEEL LINER 1-8OZ AMBER		—		✓	✓	✓				
	BCB-BI-2527		7/13	1541	SOIL	↓		—		✓	✓	✓				
																625387 ↓ 406 416
																625461 ↓ 464 466

Relinquished by:
Signature Sam S
Printed SAM SMITH
Company EARTH TECH
Reason SHIPPING

Date 7/13
Time 1800

Received by:
Signature V Batt
Printed V. BATTEN
Company CompuChem
Reason

Relinquished by:
Signature
Printed
Company
Reason

Date
Time

Received by:
Signature
Printed
Company
Reason

Method of Shipment: FED EX
AIRBILL No. ~~Shipment No.~~ 4569800785
Special Instructions:

Comments: CLP 3/90; SAMPLING NOT COMPLETE

07/14/94 RECEIVED IN GOOD CONDITION

After analysis, samples are to be:
- [ ] Disposed of (additional fee)
- [ ] Stored (90 days max)
- [ ] Stored over 90 days (additional fee)
- [ ] Returned to customer

F1000

The Earth Technology Corporation
Analytical Laboratories
5702 Bolsa Ave.
Huntington Beach, Ca. 92649
(714) 892-2565 FAX (714) 890-4032

Chain of Custody Record

Lab job no.:
Date 7/13/94
Page 1 of 2

Client 110TH FG, MIANG; BATTLE CREEK, MI
Address EARTH TECH
Project Name / Number 94-8901-05
Contract / Purchase Order / Quote

Project Manager J. BRIEGEL
Telephone No. (615) 483-9404
Fax. No. (615) 481-3834
Samplers: (Signature) Sam S.

Laboratory Sample Number	Field Sample Number	Location	Date	Time	Sample Type	Type/Size of Container	Preservation Temp.	Preservation Chemical	No. of Containers	VOA-GC/MS	SV-GC/MS	PP METALS				Remarks
✓	BCE-B1-0002	~~1-3~~ SS 7/13	7/12	1540	SOIL	1-STAINLESS STEEL LINER 1-8OZ AMBER		—	2	✓	✓	✓				625491, 492, 493
✓	BCE-B1-3032		7/12	1750	SOIL			—	2	✓	✓	✓				625 494 525, 495, 496
✓	BCE-B2-0002		7/12	1815	SOIL			—	2	✓	✓	✓				625497, 503, 507
✓	BCE-B2-3022		7/12	1922	SOIL			—	2	✓	✓	✓				625529, 536, 558
	BCER6		7/13	1305	RINS	2-40ML VOA ~~+ 500~~ 7/13 1-1000ML - 2-1L AMBER		1000mL-HNO3	5	✓	✓	✓				SV AND VOA's UNPRESERVED 625424, 625427, 625430
✓	BCB-B2-0002		7/13	0817	SOIL	1-STAINLESS STEEL LINER 1-8OZ AMBER		—	2	✓	✓	✓				625467, 625469, 625478
✓	BCB-B2-2022		7/13	0908	SOIL			—	2	✓	✓	✓				625431, 625435, 625437
✓	BCB-B3-0002		7/13	1600	SOIL			—	2	✓	✓	✓				625479, 625483, 625487
✓	BCB-B3-1011		7/13	1025	SOIL			—	2	✓	✓	✓				625438, 625444, 625445
✓	BCB-B4-0002		7/13	1057	SOIL			—	2	✓	✓	✓				625488, 625489, 625490
✓	BCB-B4 0507		7/13	1105	SOIL			—	2	✓	✓	✓				625491, 625492, 493
	BCB-B4-1012		7/13	1115	SOIL				2	✓	✓	✓				

Relinquished by:
Signature Sam S.
Printed SAM SMITH
Company EARTH TECH
Reason SHIPPING
Date 7/13
Time 1800

Received by:
Signature V Batt
Printed V. BATTEN
Company COMPUCHEM
Reason

Relinquished by:
Signature
Printed
Company
Reason

Date
Time

Received by:
Signature
Printed
Company
Reason

Method of Shipment: FED EX
AIRBILL No. ~~Shipment No.~~ 9569800785
Special Instructions:

Comments: CLP 3/90; SAMPLING NOT COMPLETE

07/14/94 RECEIVED IN GOOD CONDITION

After analysis, samples are to be:
- ☐ Disposed of (additional fee)
- ☐ Stored (90 days max)
- ☐ Stored over 90 days (additional fee)
- ☐ Returned to customer

F1000

The Earth Technology Corporation
Analytical Laboratories
5702 Bolsa Ave.
Huntington Beach, Ca. 92649
(714) 892-2565 FAX (714) 890-4032

Chain of Custody Record

Lab job no.:
Date 7/15/94
Page 1 of 1

8

Client 110TH FG, MIANG; BATTLE CREEK, MI
Address EARTH TECH
Project Name / Number 94-8901-05
Contract / Purchase Order / Quote

Project Manager J. BRIEGEL
Telephone No. (615)483-9404
Fax. No. (615) 481-3834
Samplers: (Signature)

Laboratory Sample Number	Field Sample Number	Location	Date	Time	Sample Type	Type/Size of Container	Preservation Temp.	Preservation Chemical	No. of Containers	VOA GC/MS	SV GC/MS	PP METALS				Remarks
	BCG-B5-1012	1605	7/15		SOIL	1-STAINLESS STEEL 1-8OZ AMBER		—	2	✓	✓	✓				
	BCG-B6-1012	1641	7/15		SOIL			—	2	✓	✓	✓				
	BCG-B7-1012	1720	7/15		SOIL			—	2	✓	✓	✓				
	BCG-B7-1012	1727	7/15		SOIL			—	2	✓	✓	✓				Did not Receive
						620411										MS 7/18/94
						426										
						437										
						412										
						427										
						438										
						413										
						428										

Relinquished by:	Date / Time	Received by:	Relinquished by:	Date / Time	Received by:
Signature	Date 7/15	Signature 439	Signature	Date 7/18/94	Signature M Ste
Printed SAM SMITH		Printed 425	Printed		Printed M. STEVENS
Company EARTH TECH	Time 1930	Company 436	Company	Time 0830	Company CompuChem
Reason SHIPPING		Reason 444	Reason		Reason

Method of Shipment: FED EX
Shipment No. 9569800741
Special Instructions:

Comments:

After analysis, samples are to be:
- ☐ Disposed of (additional fee)
- ☐ Stored (90 days max)
- ☐ Stored over 90 days (additional fee)
- ☐ Returned to customer

F1000

№ 1901

CHAIN-OF-CUSTODY RECORD

COMPUCHEM ENVIRONMENTAL CORPORATION
3306 Chapel Hill/Nelson Highway
Research Triangle Park, NC 27709

1-800-833-5097

Ship to: COMPUCHEM

Project Name: 110TH FG, MIANG, BATTLECREEK, MI

Field Point-of-Contact: J. BRIEGEL

Telephone No: (615) 483-9404

Sampling for project complete? Y or (N) (See Note 1.)

Project-specific (PS) or Batch (B) QC: ____

Sampler Name: SAM J. SMITH

Sampler Signature: [signature]

Carrier: FED EX

Airbill No.: 1567893250

Box #1: 1. Surface Water 2. Ground Water 3. Leachate 4. Rinsate 5. Soil/Sediment/Sludge 6. Trip Blank 7. Oil 8. Waste 9. Other: ____

Box #2: A. HCl B. HNO_3 C. $NaHSO_4$ D. $Na_2S_2O_3$ E. Ice Only O. Other: ____ N. Not Preserved

Box #3: F. Filtered U. Unfiltered

Box #4: C. CLP 3/90 S. SW-846 W. CWA 600-series L. Low Conc. CLP R. Radiological T. TCLP O. Other — (2)

Box #5: H - High M - Medium L - Low

Sample ID (Organics: 9 characters max, Inorganics: 6 characters; see Note 2)	Date: Year: 1994	Time	Box #1 Matrix	Box #2 Preservative	Box #3 Filtered/Unfiltered	Box #4 Method	Box #5 Expect. Conc.	No. of Bottles	Use for Lab QC (MS or DUP)	Organics Analysis: VOA-GC/MS	SV-GC/MS	Pest/PCB-GC	Herb-GC	VOA-GC	Inorganics: Metals (PP)	Mercury	Cyanides	Other: Radiologicals	TOC/TOX	O&G/TPH	Phenols	Other	Remarks/Comments
BCER8	7/16	11:00	4	E	U	C	L	2		✓													UNPRESERVED
BCER8	7/16	11:00	4	E	U	C	L	2			✓												UNPRESERVED
BCER8	7/16	11:00	4	B	U	C	L	1							✓								626398 L 406
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					

Client's Special Instructions:

Lab: Received In Good Condition? (Y) or N

Describe Problems, If Any:

#1 Relinquished By: (Sig) [signature]	Date: 7/16	#2 Relinquished By: (Sig)	Date:	#3 Relinquished By: (Sig)	Date:	Sample storage time requested? ____ (in days, see Note 3)
Company Name: EARTH TECH	Time: 1800	Company Name:	Time:	Company Name:	Time:	
#1 Received By: (Sig) M. S[signature]	Date: 7/18/94	#2 Received By (Sig)	Date:	#3 Received By: (Sig)	Date:	DESTROY or RETURN data after five years of archival? (Circle choice, see Note 4)
Company Name: CompuChem	Time: 0830	Company Name:	Time:	Company Name:	Time:	

[redacted] Note (1): [redacted] will ho[redacted]ed to a[redacted]mainder of project-maximizing batch size and minimizing QC ratio; if "Y" lab will begin processing batches now. Note (2): If CLP Inorganics diskette required, ID limited to maximum of six characters. [redacted] Note (4) [redacted] copies [redacted] destroy[redacted] five years unless client requests and pays for return of copies; annual storage fee billed in January of year six.

Note (3): Samples stored 60 days after date report mailed at no extra ch[redacted]

The Earth Technology Corporation

~~Analytical Laboratories~~
~~5702 Bolsa Ave.~~
~~Huntington Beach, Ca. 92649~~
~~(714) 892-2565~~ ~~FAX (714) 890-4032~~

Chain of Custody Record

8

Lab job no.:
Date 7/15/94
Page 1 of

Client 110TH FG, MIANG; BATTLE CREEK, MI
Address EARTH TECH
Project Name / Number 94-8901-05
Contract / Purchase Order / Quote

Project Manager J. BRIEGEL
Telephone No. (615) 483-9404
Fax. No. (615) 481-3834
Samplers: (Signature) Sam Smith

Laboratory Sample Number	Field Sample Number	Location	Date	Time	Sample Type	Type/Size of Container	Preservation Temp.	Preservation Chemical	No. of Containers	VOA GC/MS	SV GC/MS	PP METALS				Remarks
	BCER7		7/15	0800	4	2-1L AMBER		—			✓					UNPRESERVED
	BCER7		7/15	0800	4	2-40mL		HCL		✓						626415
	BCER7		7/15	0800	4	1-1000mL		HNO3				✓				429
	BCD-B1-0002		7/15	0955	2	1-STAINLESS STEEL 1-8oz AMBER		—		✓	✓	✓				440
	BCD-B1-~~2527~~ 2527	SS 7/15/94	7/15	1125	2			—		✓	✓	✓				419
	BCD-B2-0002		7/15	1140	2			—		✓	✓	✓				433
	BCD-B2-0507		7/15	1200	2			—		✓	✓	✓				441
						626405										423
						410										434
																442
																424
																435
																443

RECEIVED IN GOOD CONDITION
M.S. 7/15/94

Relinquished by:
Signature Sam Smith
Printed SAM SMITH
Company EARTH TECH
Reason SHIPPING

Date 7/15
Time

Received by:
Signature M. Stevens 7/18/94 0830
Printed M. STEVENS
Company Compu Chem
Reason

Relinquished by:
Signature
Printed
Company
Reason

Date
Time

Received by:
Signature
Printed
Company
Reason

Method of Shipment: FED EX
AIRBILL NO. ~~Shipment No.~~ 9569800730
Special Instructions:

Comments: CLP 8/90; SAMPLING INCOMPLETE

After analysis, samples are to be:
- ☐ Disposed of (additional fee)
- ☐ Stored (90 days max)
- ☐ Stored over 90 days (additional fee)
- ☐ Returned to customer

F1000

Kellogg SI
Battlecreek, Michigan
Inorganic Data Validation by CLP Metals
Sampling Dates: June - July 1994

Samples:

BCA-B1-0001	BCB-B4-0507	BCC-B2-1012	BCD-B2-0002
BCE-B2-0002	BCF-B3-0507		

I. Sample Holding Times: Acceptable/All criteria met

Discussion:

All samples analyzed within the 6 months for metals (28 days for mercury).

II. Initial and Continuing Calibration: Acceptable/All criteria met.

Discussion

All percent recoveries were within the appropiate control limits of 90-110% for most metals (80-120% for mercury).

III. Blank Analyses: Acceptable/With the following exceptions

Qualified Data: None

Discussion:

Method blanks (preperation blanks and inital and continuing claibration blanks), field blanks, and equipment rinseates were analyzed at the required frequency. Lead was detected in one of the initital calibration blank at 2.2 ppb. There were no associated lead detects less than 11 ppb, and qualifiers were not added. Non-detects were not qualified. Zinc was detected at 1.6 ppm in the preparation blank associated with BCA-B1-0001, BCB-B4-0507, and BCE-B2-0002. There were no associated zinc detects less than 8 ppm, and qualifiers were not added. Non-detects were not qualified.

IV. ICP Interference Check Sample (ICS) Analyses: Acceptable/All criteria met

Discussion:

Interference check sampels were analyzed at the beginning and end of each ICP analytical run, as required. All percent recoveries were within the 80-120% recovery control imits.

V. Laboratory Control Sample (LCS) Analyses: Acceptable/All criteria met

Discussion:

Two laboratory control samples (duplicate control samples) were analyzed by the laboratory with each delivery group. All percent recoveries were within the control limit of +/- 20%.

VI. Matrix Spike Sample analyses (Percent Recoveries): Acceptable/With the following exceptions.

Discussion:

Antimony, arsenic, lead, and thallium reported low recovery in the matrix spike for sample BCD-B2-0002. The sample detects for these metals were qualified "L". Non-detects were qualified "UL". Antimony, cadmium, chromium, selenium, and zinc reported low recoveries in the matrix spike associated with BCA-B1-0001, BCB-B4-0507, and BCE-B2-0002. Sample detects for these metals were qualified "L". Non-detects were qualified "UL". Lead and selenium reported low recovery in the matrix spike for sample BCC-B2-1012 and BCF-B3-0507. The sample detects for these metals were qualified "L". Non-detects were qualified "UL".

VII. Duplicate Sample Analyses (Relative Percent Differences): Acceptable/all criteria met

Discussion:

All analyses met the appropiate control limit.

VIII Furnace AA Quality Control Analyses (GFAA): Acceptable/all criteria met

Discussion:

All spike recoveries met the control limit of 20%.

IX. ICP Serial Dilution: Acceptable/With the following exceptions

Qualified Data: None

Discussion

Beryllium, chromium, copper, nickel, and zinc exceeded the the 10% control limit for ICP serial dilution analysis for BCD-B2-0002. No sample detects were greater the 50 times the IDL nad qualifiers were not added. Arsenic, beryllium, chromium, copper, lead, nickel, and zinc exceeded the 10% control limit for the ICP serial dilution analysis for BCA-B1-0001, BCB-B4-0507, and BCE-B2-0002. No sample detects were greater the 50 times the IDL nad qualifiers were not added. Antimony, chromium, copper, nickel, and zinc exceeded the the 10% control limit for ICP serial dilution analysis for BCD-B2-0002. No sample detects were greater the 50 times the IDL nad qualifiers were not added.

Kellogg SI
Battlecreek, Michigan
Volatile Organic Data Validation by SW-846 Method 8240
Sampling Dates: June - July 1994

Samples:

BCA-B1-0001	BCB-B4-0507	BCC-B2-1012	BCD-B2-0002
BCE-B2-0002	BCF-B3-0507		

I. Sample Holding Times: Acceptable/All criteria met

Discussion:

All samples analyzed within 14 days.

II. GC/MC Instrument Performance Check: Acceptable/All criteria met

Discussion:

Bromofluorobenzene (BFB) was analyzed at the beginning of each 12 hour calibration period. All samples were analyzed within 12 hours the BFB tune.

III. Initial and Continuing Calibration: Acceptable/With the following exceptions.

Qualified Data:

Compound	Sample ID	Qualifier
Methylene chloride	BCB-B4-0507	J
	BCE-B2-0002	J
Acetone	BCA-B1-0001	J
	BCB-B4-0507	J
	BCC-B2-1012	J
	BCD-B2-0002	J
	BCE-B2-0002	J
	BCF-B3-0507	J

Discussion

All relative response factors (RRF) in the initial calibrations were above the 0.05 lower control limit. Methylene chloride and acetone had percent relative standard deviations (%RSD) above the 30% control limit in the initial calibration associated with all samples. Detects for methylene chloride and acetone were qualified "J" in all associated samples. All detects for methylene chloride and several detects for acetone were later qualified "B" due to blank contanimation.

Continuing calibrations were performed at the proper frequency. All RRF were above the 0.05 control limit. Several continuing calibrations reported compounds with response factor percent difference (%D) greater than the maximum allowable value of +/- 25%. The compounds are listed in the data validation worksheets. Qualifiers were not added for non-detects.

IV. Blank Analyses: Acceptable/With the following exceptions

Qualified Data

Compound	Sample ID	Qualifier
Methylene chloride	BCA-B1-0001	B
	BCB-B4-0507	B
	BCC-B2-1012	B
	BCD-B2-0002	B
	BCE-B2-0002	B
	BCF-B3-0507	B
Acetone	BCA-B1-0001	B
	BCB-B4-0507	B
	BCE-B2-0002	B

Discussion:

Method blanks, field blanks, and equipment rinseates were analyzed at the required frequency. Methylene chloride and acetone were detected in both of the method blanks. Sample detects less than 10 times the concentration detected in the associated method blank were qualified "B". Non-detects and sample detects greater than ten times the associated blank concentration were not qualified.

V. Surrogate Recovery: Acceptable/All within criteria

Discussion:

All surrogate recoveries were within the appropriate control limits.

VI. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Sample Analysis: Acceptable/.All criteria met

Discussion:

All spike recoveries (SR) and relative percent differences (RPD) were within the appropriate control limits.

VII. Internal Standards Area Performance: Acceptable/All criteria met

Discussion:

All internal standards met control criteria for retention times and area counts.

Kellogg SI
Battlecreek, Michigan
Semi-volatile Organic Data Validation by SW-846 Method 8240
Sampling Dates: June - July 1994

Samples:

BCA-B1-0001	BCB-B4-0507	BCC-B2-1012	BCD-B2-0002
BCE-B2-0002	BCF-B3-0507		

I. Sample Holding Times: Acceptable/All criteria met

Discussion:

All samples were extracted within seven days and analyzed within 40 days.

II. GC/MC Instrument Performance Check: Acceptable/All criteria met

Discussion:

Decafluorotriphenylphosphine (DFTPP) was analyzed at the beginning of each 12 hour calibration period. All samples were analyzed within 12 hours the DFTPP tune.

III. Initial and Continuing Calibration: Acceptable/With the following exceptions

Qualified Data: None

Discussion

All relative response factors (RRF) in the initial calibrations were above the 0.05 lower control limit. 4-chloroaniline, had a percent relative standard deviation (%RSD) above the 30% control limit in the initial calibration associated with four samples. 4-chloroaniline was not detected in the associated samples and qualifiers were not added.

Continuing calibrations were performed at the proper frequency. All RRF were above the 0.05 control limit. Several continuing calibrations reported compounds with response factor percent difference (%D) greater than the maximum allowable value of +/- 25%. The compounds are listed in the data validation worksheets. Qualifiers were not added for non-detects.

IV. Blank Analyses: Acceptable/With the following exceptions

Qualified Data

Compound	Sample ID	Qualifier
Bis(2-Ethylhexyl)phthalate	BCA-B1-0001	B

Discussion:

Method blanks, field blanks, and equipment rinseates were analyzed at the required frequency. Bis(2-Ethylhexyl)phthalate was detected in one of the four method blanks at 48 ppb. Sample detects less than 10 times the concentration detected in the associated method blank were qualified "B". Non-detects and sample detects greater than ten times the associated blank concentration were not qualified.

V. Surrogate Recovery: Acceptable/All criteria met

Discussion:

All surrogate recoveries were within the appropriate control limits.

VI. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Sample Analysis: Acceptable/With the following exceptions

Qualified Data: None

Discussion:

Several spike compounds reported high recoveries. The compounds were not detected in the associated samples and qualifiers were not added. All relative percent differences (RPD) were within the appropriate control limits.

VII. Internal Standards Area Performance: Acceptable/All criteria met

Discussion:

All internal standards met control criteria for retention times and area counts.

DATA SUMMARY FORM: I N O R G A N I C S

SOIL SAMPLES
(mg/Kg)

ite Name: Kellogg

ase #: ________ Sampling Date(s): ____________

+Due to dilution, sample quantitation limit is affected.
See dilution table for specifics.

CRDL	ANALYTE	1		2						3											
	Sample No.	BCA-B1-0001		BCB-B4-0507		BCC-B2-1012		BCD-B2-0002		BCE-B2-0002		BCF-B3-0507									
	Dilution Factor																				
	% Solids																				
	Location																				
40	Aluminum																				
12	Antimony		UL	3.8	L		UL		UL		UL										
2	*Arsenic	39.6		12.7		1.6		5.0	L	6.5		8.1									
40	Barium																				
1	Beryllium	[0.28]		[0.13]				[0.17]		[0.22]		[0.22]									
1	*Cadmium	[0.49]	L		UL						UL										
1000	Calcium																				
2	*Chromium	23.0	L	8.0	L	5.1		17.6		10.0	L	6.3									
10	Cobalt																				
5	Copper	8.2		4.4		3.5		3.3		6.2		6.6									
20	Iron																				
0.6	*Lead	124		4.5		1.6	L	3.2 L	~~B~~	6.9		3.4	L								
1000	Magnesium																				
3	Manganese																				
0.2	Mercury							0.17													
8	*Nickel	8.7		6.9				8.7		7.9		6.0									
1000	Potassium																				
1	Selenium		UL		UL		UL				UL		UL								
2	Silver																				
1000	Sodium																				
2	Thallium								UL												
10	Vanadium																				
4	Zinc	25.0	L	29.9	L	11.7		65.2		26.0	l	18.0									
2	*Cyanide																				

CRDL = Contract Required Detection Limit

*Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/90

DATA SUMMARY FORM: V O L A T I L E S 1

SOIL SAMPLES
(µg/Kg)

te Name: Kellogg

se # _____ Sampling Date(s): ________

To calculate sample quantitation limit:
(CRQL * Dilution Factor) / ((100 - % moisture)/100)

CRQL	COMPOUND																		
	Sample No.	BCA-B1-0001		BCB-B4-0507		BCC-B2-1012		BCD-B2-0002		BCE-B2-0002		BCF-B3-0507							
	Dilution Factor																		
	% Moisture																		
	Location																		
10	Chloromethane																		
10	Bromomethane																		
10	Vinyl Chloride																		
10	Chloroethane																		
10	Methylene Chloride	20	B	6	(B)	13	B	9	B	7	B	10	B						
10	Acetone	33	B	24	B	31	J	19	J	16	B	39	J						
10	Carbon Disulfide																		
10	1,1-Dichloroethene																		
10	1,1-Dichloroethane																		
10	Total 1,2-Dichloroethene																		
10	Chloroform																		
10	1,2-Dichloroethane																		
10	2-Butanone																		
10	1,1,1-Trichloroethane																		
10	Carbon Tetrachloride																		
10	Vinyl Acetate																		
10	Bromodichloromethane																		

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/92

CRQL = Contract [redacted]qui[redacted] Qua[redacted]tation Limit

DATA SUMMARY FORM: V O L A T I L E S 2

SOIL SAMPLES
(µg/Kg)

Nam : ____________________

#: ______ Sampling Date(s): __________

To calculate sample quantitation limit:
(CRQL * Dilution Factor) / ((100 - % moisture)/100)

	Sample No.																
	Dilution Factor																
	% Moisture																
	Location																
QL	COMPOUND																
10	1,2-Dichloropropane																
10	Cis-1,3-Dichloropropene																
10	Trichloroethene																
10	Dibromochloromethane																
10	1,1,2-Trichloroethane																
10	Benzene																
10	Trans-1,3-Dichloropropene																
10	Bromoform																
10	4-Methyl-2-pentanone																
10	2-Hexanone																
10	Tetrachloroethene																
10	1,1,2,2,-Tetrachloroethane																
10	Toluene																
10	Chlorobenzene																
10	Ethylbenzene																
10	Styrene																
10	Total Xylenes																

QL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/92

DATA VALIDATION FORM FOR VOLATILES
8240

Sample #	Continuing Calibration Compounds with %D≤25	Blanks FORM I & IV VOA	Surrogate Recovery FORM II VOA	Matrix spike/ Matrix spike Duplicates FORM III VOA 1&2	Internal Standards FORM VII VOA
	M.C. Acetone t-1,3-Di-Clpropene 2-Hexanone	Qualify hits in samples "B" if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: R1	Check number of surrogates out: ✓ Verify blanks have no surrogates out: ✓ Qualifier: Action:	Verify that spikes are within limits: OK	Internal standard area counts must not exceed upper or lower limits: Retention time within +/- 30 sec: ✓
	Acetone 1,1-Di-Cl-ethane 1,2-Di-Cl-propane 4-Methyl-2-Pentanone 2-Hexanone	Qualify hits in samples "B" if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: H6	Check number of surrogates out: ✓ Verify blanks have no surrogates out: ✓ Qualifier: Action:	Verify that spikes are within limits: OK	Internal standard area counts must not exceed upper or lower limits: ✓ Retention time within +/- 30 sec: ✓
	None	Qualify hits in samples "B" if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: O6	Check number of surrogates out: ✓ Verify blanks have no surrogates out: ✓ Qualifier: Action:	Verify that spikes are within limits: OK	Internal standard area counts must not exceed upper or lower limits: ✓ Retention time within +/- 30 sec: ✓
	Chloroethane Vinyl Cl Carbon Disulfide 1,1-Di-Cl-ethene 2-Butanone [illegible]	Qualify hits in samples "B" if the hit is less than 10x the blank hit for common contaminants and 5x for all others Blank #: S1	Check number of surrogates out: ✓ Verify blanks have no surrogates out: ✓ Qualifier: Action:	Verify that spikes are within limits: OK	Internal standard area counts must not exceed upper or lower limits: ✓ Retention time within +/- 30 sec: ✓

SITE NAME:
VALIDATED BY:
SAMPLE DELIVERY GROUP

DATA VALIDATION FORM FOR VOLATILES
8240

Sample #	Holding Times Form I VOA	GC/MS Instrument Performance Check Form V VOA	Initial Calibration FORM VI VOA	Initial Calibration Compounds With %D ≤30	Continuing Calibration FORM VII VOA
BCF-B2-0002	Sample date: 7-13-94 Date Received: 7-14-94 Analyzed: 7-25-94 Holding time: 12 d Instrument # : 54 Matrix:	Date: 7-25-94 Time: 1424 Ion abundance: Sample analyzed: 2213	Date: 7-6-94 Instrument: 54 Time: 1721 RRF≥ 0.05: ✓ Avg RRF ≥ 0.05: ✓ %RSD≤30: ✓	Methylene Chloride [illegible]	Verify RRF≥.05 Qualify R or L if not: %D +/-25: Qualify J or UJ if not: Time: 1741 7-25-94 Instrument: 54
BCF-B3-0502	Sample date: 7-14-94 Date Received: 7-15-94 Analyzed: 7-21-94 Holding time: 7 d Instrument # : A13 Matrix:	Date: 7-21-94 Time: 0137 Ion abundance: Sample analyzed: 1020	Date: 7-19-94 Instrument: A13 Time: 1251 RRF≥ 0.05: ✓ Avg RRF ≥ 0.05: ✓ %RSD≤30: ✓	Acetone	Verify RRF≥.05 ✓ Qualify R or L if not: %D +/-25: Qualify J or UJ if not: Time: 0156 7-21-94 Instrument: A13
	Sample date: Date Received: Analyzed: Holding time: Instrument # : Matrix:	Date: Time: Ion abundance: Sample analyzed:	Date: Instrument: Time: RRF≥ 0.05: Avg RRF ≥ 0.05: %RSD≤30:		Verify RRF≥.05 Qualify R or L if not: %D +/-25: Qualify J or UJ if not: Time: Instrument:
	Sample date: Date Received: Analyzed: Holding time: Instrument # : Matrix:	Date: Time: Ion abundance: Sample analyzed:	Date: Instrument: Time: RRF≥ 0.05: Avg RRF ≥ 0.05: %RSD≤30:		Verify RRF≥.05 Qualify R or L if not: %D +/-25: Qualify J or UJ if not: Time: Instrument:

SITE NAME:
VALIDATED BY:
SAMPLE DELIVERY GROUP

DATA VALIDATION FORM FOR VOLATILES
8240

Sample #	Holding Times (Form I VOA)	GC/MS Instrument Performance Check (Form V VOA)	Initial Calibration (FORM VI VOA)	Initial Calibration Compounds With %D ≤30	Continuing Calibration (FORM VII VOA)
BCA-B1-0001	Sample date: 6-30-94 Date Received: 7-1-94 Analyzed: 7-7-94 Holding time: 7d Instrument # : 51 Matrix:	Date: 7-6-94 Time: 2202 Ion abundance: Sample analyzed: [illegible]	Date: 6-22-94 Instrument: 51 Time: 1331 RRF≥ 0.05: ✓ Avg RRF ≥ 0.05: %RSD≤30: ✓	Acetone 2-Butanone	Verify RRF≥.05 Qualify R or L if not: %D +/-25: Qualify J or UJ if not: Time: [illegible] Instrument: 51
BCB-B4-0507	Sample date: 7-13-94 Date Received: 7-14-94 Analyzed: 7-25-94 Holding time: 12d Instrument # : 54 Matrix:	Date: 7-25-94 Time: 1428 Ion abundance: Sample analyzed: 2040	Date: 7-6-94 Instrument: 54 Time: 1721 RRF≥ 0.05: ✓ Avg RRF ≥ 0.05: %RSD≤30: ✓	Methylene Chlor[illegible] Acetone	Verify RRF≥.05 Qualify R or L if not: %D +/-25: ✓ Qualify J or UJ if not: Time: 1491 7-25-94 Instrument: 54
BCC-B2-1012	Sample date: 7-15-94 Date Received: 7-16-94 Analyzed: 7-25-94 Holding time: 10d Instrument # : 03 Matrix:	Date: 7-25-94 Time: 1520 Ion abundance: Sample analyzed: 2155	Date: 7-25-94 Instrument: 03 Time: 1322 RRF≥ 0.05: Avg RRF ≥ 0.05: %RSD≤30: ✓	2-Butanone Acetone 2-Hexanone	Verify RRF≥.05 ✓ Qualify R or L if not: %D +/-25: Qualify J or UJ if not: Time: 7-25-94 1537 Instrument: 03
BCD-B2-0002	Sample date: 7-17-94 Date Received: 7-18-94 Analyzed: 7-23-94 Holding time: 6d Instrument # : 13 Matrix:	Date: 7-2-94 Time: [illegible] Ion abundance: Sample analyzed: [illegible]	Date: 7-19-94 Instrument: 13 Time: [illegible] RRF≥ 0.05: ✓ Avg RRF ≥ 0.05: - %RSD≤30:	Acetone	Verify RRF≥.05 Qualify R or L if not: %D +/-25: Qualify J or UJ if not: Time: [illegible] Instrument:

SITE NAME:
VALIDATED BY:
SAMPLE DELIVERY GROUP

$\frac{R1}{MC-18}$ $\frac{H6}{MC-7}$ $\frac{06}{MC-8}$ $\frac{51}{MC-10}$

Acetone [illegible] Acetone [illegible]

APPENDIX G: MICHIGAN DEPARTMENT OF NATURAL RESOURCES ENVIRONMENTAL RESPONSE DIVISION OPERATIONAL MEMORANDUM

- 8 (Revision 4)
- 12 (Revision 2)
- 14 (Revision 2)
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MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

June 5, 1995

TO: Environmental Response Division Staff

FROM: Alan J. Howard, Chief, Environmental Response Division

SUBJECT: **Interim Environmental Response Division Operational Memorandum #8, Revision 4:** Generic Residential Cleanup Criteria

THIS DRAFT, INTERIM OPERATIONAL MEMORANDUM HAS BEEN PREPARED TO FACILITATE IMPLEMENTATION OF THE 1995 AMENDMENTS TO PART 201 OF THE NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT, 1994 PA 451 (FORMERLY THE MICHIGAN ENVIRONMENTAL RESPONSE ACT). THIS OPERATIONAL MEMORANDUM WILL TAKE EFFECT *ONLY* WHEN HOUSE BILL 4596 IS SIGNED INTO LAW. INTERNAL REVIEW OF THIS MEMORANDUM IS ON-GOING, AND NO OUTSIDE REVIEW HAS BEEN COMPLETED. THE CONTENT OF THE MEMORANDUM, AND THE ATTACHED CRITERIA, ARE SUBJECT TO CHANGE AND SHOULD BE RELIED UPON ONLY AFTER CONFIRMATION WITH APPROPRIATE ERD STAFF.

Revision 4 of this Operational Memorandum reflects changes made as a result of two major legislative actions: (1) the incorporation of the Michigan Environmental Response Act (MERA), 1982 PA 307, as amended, (2) into the Natural Resources and Environmental Protection Code, 1994 PA 451; and the 1995 amendments to Part 201 contained in [House Bill 4596]. Enactment of the Natural Resources and Environmental Protection Act resulted in new section numbers for all of the former MERA, but did not make any substantive changes in the law. [House Bill 4596] substantially amends Part 201. Those amendments, particularly the changes in cleanup standards, are reflected in this revision of Operational Memorandum #8. Unless otherwise noted, Section references in this memorandum are to Part 201 of Act 451.

The attached table lists generic residential cleanup criteria which have been developed pursuant to Sections 20120A(1)(A) and (3), according to the updated algorithms presented in this memo. This table replaces the previously issued list of Type B criteria dated February 4, 1994. The label of "Type B" has been eliminated and the criteria are now referred to as generic residential criteria. The algorithms as presented in the administrative rules of the Michigan Environmental Response Act, 1982 Public Act 307, as amended, have been replaced by updated algorithms which represent current U.S. Environmental Protection Agency (EPA) guidance and a format consistent with the industrial/commercial equations and those used by the Underground Storage Tank Division (USTD).

The criteria were developed using currently available toxicological data, exposure data, and other data and are subject to change as new data become

available. These criteria are presented in two significant figures; reference doses and slope factors used to generate the criteria were also reported in two significant figures. Cleanup criteria from the attached table should be compared to analytical data presented in two significant figures, as well.

This list presents noncarcinogens and carcinogens together; carcinogens are presented in bold and italics. Chemicals beginning with numbers (such as 1,1,2-trichloroethane) are incorporated alphabetically within the list. Criteria on these lists should be considered draft; final cleanup criteria will be confirmed by Environmental Response Division (ERD) toxicologists and approved as part of a specific remedial action plan (RAP). Staff are reminded that generic residential RAPs must address all elements required by Part 201 and the administrative rules, including those for which specific criteria have not been developed. Additional guidance follows.

Note that in cases where generic residential criteria are less than target method detection limits (MDLs) or background, target MDLs or background levels become the cleanup goal. Generic residential criteria are not relevant in these cases.

The table presents values for the subrules that are most often expected to be the controlling factor in determining soil cleanup criteria. However, a generic residential RAP must include rationale that supports the conclusions drawn from the assessment of pertinent pathways (i.e., some discussion of each pertinent pathway must be included which assesses whether more restrictive criteria are required; See R 299.5711(1) and R 299.5711(6).

HEALTH-BASED AND AESTHETIC DRINKING WATER VALUES

The values in the first column of the table were developed using the residential groundwater algorithms presented later in this memo for carcinogens and noncarcinogens. The values in the second column of the table were established, where sufficient data are available, to protect against adverse aesthetic impacts of hazardous substances on groundwater.

The most restrictive of the values in the first two columns of the table is the cleanup criterion required to satisfy Section 20120A(4) of Part 201. However, where a State Drinking Water Standard has been established, that standard will override the health-based drinking water criteria, as indicated in Sec. 20120A(5) of Part 201. A more restrictive aesthetic criterion will take precedence over the State Drinking Water Standard. Note that Rule 299.5709, referenced in Section 20120A(5), requires that aquifer cleanup criteria take into account adverse aesthetic impacts resulting from one or a combination of hazardous substances. If adverse aesthetic impacts remain when health-based criteria have been achieved, further remedial measures may be required. Consult your Supervisor if you encounter such a case.

IMPACTS OF GROUNDWATER CONTAMINANTS ON SURFACE WATER

The third column in the table lists values based on calculations done by Surface Water Quality Division (SWQD) in accordance with Rule 323.1057 of Part 4 of Part 31 of the Natural Resources and Environmental Protection Act, 1994 PA 451 (formerly known as the Water Resources Commission Act, 1929, PA 245, as amended) or on the National Toxics Rule (NTR; Federal Register, December 22, 1992. Vol. 57(246):60848-60923). For use in ERD programs, the criterion which protects surface water has been termed the groundwater surface water interface (GSI) value. The final GSI value is the more restrictive of the Rule 57 value and the NTR value, where both are available (with the exception of arsenic whose GSI value is the Rule 57 value even though it is greater than the NTR value). Where only one of the two values is available, that number becomes the GSI value.

The GSI values are the criteria used to judge compliance with Rule 299.5713. GSI values are developed for surface water which is not used as a drinking water source and also for surface water which serves as a source of drinking water. GSI values presented in the list are for surface waters not protected as a drinking water source. If the surface water at a site serves as a drinking water source, contact an ERD toxicologist to obtain the correct GSI value. In cases where data are inadequate to calculate a GSI value, the party proposing the remedial action may generate the minimum data necessary to propose a value for Department review and approval.

Prior to passage of the 1995 amendments, a mixing zone was not allowed when assessing the impact of groundwater venting to a surface water. A mixing zone is now allowed for venting groundwater at those sites where an additional load to the receiving stream of site-specific contaminants is allowable and where a mixing zone is appropriate for the receiving stream. If a RAP allows for venting groundwater, the discharge must comply with requirements of Part 31 of Act 451 and the relevant rules promulgated under that Part.

Demonstration of compliance with surface water requirements may be made by assessing groundwater concentrations at the groundwater-surface water interface or through evaluation of mixing zone, whichever is appropriate for a particular site. Predictive modeling and direct monitoring are options to establish compliance with the GSI value at the groundwater-surface water interface. If the groundwater-surface water interface is the compliance point for a particular site, it is not necessary that the GSI value be achieved throughout the aquifer. However, a remedial action plan which proposes to meet the GSI value throughout the aquifer in lieu of monitoring at the interface or modeling will be acceptable.

Note that the sixth column on the table will show 20 times the GSI values. This value is shown for ease of reference in cases where soil is to be remediated to that level as a source control measure. Rule 299.5711 does not require that soil meet the "20 times GSI values", as long as the GSI value is not exceeded at the appropriate compliance point.

SOIL CRITERIA PROTECTIVE OF GROUNDWATER

The "20X" values in the table are provided for convenience and are not mandatory if leachate tests or other methods which better represent in situ conditions support the use of a higher value (refer to Operational Memo #12 for guidance on appropriate leachate methods). For certain chemicals which strongly adsorb to soil and are known not to leach at significant concentrations (i.e., PCBs, carcinogenic polynuclear aromatic hydrocarbons and some chlorinated pesticides), the direct contact value is accepted as the soil cleanup criterion to protect groundwater in addition to the protection against long-term, systemic direct contact hazards. However, there are certain situations (i.e., presence of solvents or collection of unfiltered groundwater samples) which could result in the presence of these types of materials in groundwater. These other conditions should be evaluated before a chemical is considered nonmobile in soil. Consult an ERD toxicologist if you think direct contact values for other contaminants would be protective of groundwater or if you have questions about conditions that could cause the transport of a nonmobile contaminant through soil.

SOIL DIRECT CONTACT CRITERIA

Direct contact criteria only consider long-term, systemic exposure from ingestion of and dermal contact with contaminated soil. Consequently, there

are other potential concerns that may need to be addressed (see discussion of issues not addressed by the direct contact criteria presented below).

Compliance with direct contact criteria are required throughout the affected media in the unlimited residential land use category, but exposure controls and land use restrictions may be employed to prevent exposures to more highly contaminated soils at depth under the limited residential land use category.

Average on-site soil concentrations, represented as a 95% upper confidence level (UCL) on the arithmetic mean, may be used to determine compliance with the soil direct contact value. On-site 95% UCLs should, however, reasonably represent the areas over which exposures are expected to occur. Typically, the exposure area for a residential property is approximately one-quarter acre in size. Refer to EPA guidance on how to appropriately calculate the 95% UCL (EPA, 1992a).

Issues Not Addressed by the Direct Contact Criteria

Inhalation: All RAPs must document that they are protective of the public health, safety and welfare and the environment. As a result, they must contain some discussion of potential inhalation risks, and whether inhalation (i.e. exposure through volatile or particulate contaminant emissions) is a pertinent pathway for human exposure at the site in question. The direct contact criteria do not address and are not applicable for the inhalation pathway because they do not incorporate potential inhalation effects, long-term or acute, of hazardous substances in soil.

Chemical characteristics which are pertinent to this discussion include vapor pressure and/or Henry's Law constant, the potential to cause cancer via the inhalation route, the potential to cause irritation of respiratory tissue and special characteristics which may make a contaminant an inhalation hazard (e.g., friable asbestos). The RAP should indicate whether any materials with these characteristics are present. If such materials are present, it may be necessary to conduct a risk assessment of the inhalation pathway to determine if lower cleanup criteria are required for protection of human health. Consult an ERD toxicologist for guidance. If no significant inhalation risk exists, criteria and/or exposure control measures which are protective for other routes of exposure will be deemed protective for the inhalation pathway and a narrative assessment for the inhalation pathway will be sufficient.

Dermal Toxicity: The direct contact soil equation does not address acute skin toxicity or skin sensitization. These concerns may have to be addressed before chemicals with skin toxicity or sensitization characteristics can be left in place at the direct contact value. Contact an ERD toxicologist for guidance.

Ecological Concerns: RAPs must also address ecological concerns. The RAP should include a description of the physical setting of the site, including any natural resources which could be affected by the release(s) addressed in the plan. In general, potential ecological impacts are defined as adverse impacts on a community or a population of organisms rather than on an individual who is the focus of a human health risk assessment. An ecological risk assessment will be required only if there is a "sensitive environmental resource" present at or near the site, or if there are other special circumstances such as concern for persistent or bioaccumulative hazardous substances, which may adversely effect the food chain, or a physical feature that would attract wildlife to the site (e.g., migratory waterfowl habitat).

Professional judgment must be used to determine whether it is likely that criteria more restrictive than those required to protect public health, or those required pursuant to other applicable regulations (e.g., groundwater/surface water interface criteria), are necessary to protect natural resources at or near the site. If ERD staff believe that there is a need for an ecological assessment, this should be reviewed with your supervisor and other technical experts as appropriate. Ecological risk assessments will be the exception rather than the rule.

TARGET METHOD DETECTION LIMITS

The table also includes the target method detection limits (MDLs) for each hazardous substance, where one has been determined. These target MDLs are taken from Operational Memorandum #6, revision 4 and are provided to allow for convenient comparison between generic residential criteria and target MDLs. Consult Operational Memorandum #6 for a full description of the use of target MDLs and proper methods for analysis.

The use of particular methods and detection limits listed in Operational Memorandum #6 are not mandatory. Other methods or detection limits may be approved as part of a site-specific RAP.

These target MDLs are applicable to environmental investigations and monitoring performed pursuant to Part 201 response activities. These detection limits may not be applicable to environmental monitoring activities performed pursuant to other Parts of Act 451 or environmental statutes. Facilities subject to regulation under other environmental statutes should consult with the appropriate DNR Division for further information regarding appropriate analytical detection limits.

GENERIC RESIDENTIAL ALGORITHMS

RESIDENTIAL GROUNDWATER ALGORITHMS:

CARCINOGENS:

$$C_{dw} = \frac{10^{-5} \times BW \times AT \times CF}{SF \times EF \times ED \times IR_{dw}}$$

where,

C_{dw} (risk-based drinking water concentration)	= in ug/l (ppb)
10^{-5} cancer risk	= acceptable risk
BW (body weight)	= 70 kg
AT (averaging time in days)	= 25,550 days (70 x 365)
CF (conversion factor)	= 1000 ug/mg
SF (cancer slope factor, $mg/kg\text{-}d^{-1}$)	= chemical-specific
EF (exposure frequency)	= 350 d/yr
ED (exposure duration)	= 30 yr
IR_{dw} (drinking water ingestion rate)	= 2 liter/day

NONCARCINOGENS:

$$C_{dw} = \frac{HQ \times RfD \times BW \times AT \times RSC \times CF}{EF \times ED \times IR_{dw}}$$

where,	C_{dw} (risk-based drinking water concentration)	= in ug/l (ppb)
	HQ (hazard quotient)	= 1
	RfD (oral reference dose, mg/kg/d)	= chemical-specific
	BW (body weight)	= 70 kg
	AT (averaging time)	= 10,950 days (30 x 365)
	RSC (relative source contribution)	= 0.2
	CF (conversion factor)	= 1000 ug/mg
	EF (exposure frequency)	= 350 d/yr
	ED (exposure duration)	= 30 yr
	IR_{dw} (drinking water ingestion rate)	= 2 liter/day

RESIDENTIAL DIRECT CONTACT SOIL CRITERION ALGORITHMS:

CARCINOGENS:

$$C_s = \frac{10^{-5} \times AT \times CF}{SF \times FC \times [(EF_i \times IF \times AE_i) + (EF_d \times DF \times AE_d)]}$$

where,	C_s (risk-based soil concentration)	= ug/kg (ppb)
	10^{-5} cancer risk	= acceptable risk
	AT (averaging time)	= 25,550 days (70 x 365)
	CF (conversion factor)	= 1E+9 ug/kg
	SF (cancer slope factor, $mg/kg\text{-}d^{-1}$)	= chemical-specific
	FC (fraction of soil contaminated)	= 1
	EF_i (ingestion exposure frequency)	= 350 d/yr
	EF_d (dermal exposure frequency)	= 245 d/yr
	IF (age-adjusted soil ingestion factor)	= 114 mg-yr/kg-d*
	AE_i (ingestion absorption efficiency)	= (see text)
	DF (age-adjusted soil dermal factor)	= 2442 mg-yr/kg-d**
	AE_d (dermal absorption efficiency)	= (see text)

NONCARCINOGENS:

$$\frac{HQ \times RfD \times AT \times CF}{FC \times [(EF_i \times IF \times AE_i) + (EF_d \times DF \times AE_d)]}$$

where,	C_s (risk-based soil concentration)	= ug/kg (ppb)
	HQ (hazard quotient)	= 1
	RfD (oral reference dose, mg/kg/d)	= chemical-specific
	AT (averaging time)	= 10,950 days (30 x 365)
	CF (conversion factor)	= 1E+9 ug/kg
	FC (fraction soil contaminated)	= 1
	EF_i (ingestion exposure frequency)	= 350 d/yr
	EF_d (dermal exposure frequency)	= 245 d/yr
	IF (age-adjusted soil ingestion factor)	= 114 mg-yr/kg-d*
	AE_i (ingestion absorption efficiency)	= (see text)
	DF (age-adjusted soil dermal factor)	= 2442 mg-yr/kg-d**
	AE_d (dermal absorption efficiency)	= (see text)

$$*IF_{soil/age-adj.} = \frac{IR_{soil/age\ 1-6} \times ED_{age\ 1-6}}{BW_{age\ 1-6}} + \frac{IR_{soil/age\ 7-31} \times ED_{age\ 7-31}}{BW_{age\ 7-31}}$$

where,

$IR_{soil/age\ 1-6}$ (soil ingestion rate)	= 200 mg/day
$ED_{age\ 1-6}$ (exposure duration)	= 6 years
$BW_{age\ 1-6}$ (body weight)	= 15 kg
$IR_{soil/age\ 7-31}$ (soil ingestion rate)	= 100 mg/d
$ED_{age\ 7-31}$ (exposure duration)	= 24 yr
$BW_{age\ 7-31}$ (body weight)	= 70 kg

$$**DF_{soil/age-adj.} = \frac{SA_{age\ 1-6} \times AF \times ED_{age\ 1-6}}{BW_{age\ 1-6}} + \frac{SA_{age\ 7-31} \times AF \times ED_{age\ 7-31}}{BW_{age\ 7-31}}$$

where,

$SA_{age\ 1-6}$ (skin surface area)	= 1820 cm^2/day
AF (soil adherence factor)	= 1.0 mg/cm^2
$ED_{age\ 1-6}$ (exposure duration)	= 6 years
$BW_{age\ 1-6}$ (body weight)	= 15 kg
$SA_{age\ 7-31}$ (skin surface area)	= 5000 cm^2/day
AF (soil adherence factor)	= 1.0 mg/cm^2
$ED_{age\ 7-31}$ (exposure duration)	= 24 yr
$BW_{age\ 7-31}$ (body weight)	= 70 kg

The residential equations yield values which represent concentrations of contaminants in water in units of micrograms per liter (ug/l) and in soil in units of micrograms per kilogram (ug/kg), or parts per billion (ppb). To convert to units of parts per million or milligrams per liter (mg/l) in water and milligrams per kilogram (mg/kg) in soil, divide by 1,000.

All exposure assumptions represent current EPA guidance. The selection of an appropriate averaging time (AT) is dependent upon the type of toxic effect being evaluated. AT represents the number of days over which the exposure is averaged. When evaluating long-term exposure to noncarcinogenic compounds, exposures are calculated by averaging over the period of exposure (i.e., subchronic or chronic exposures). For carcinogenic compounds, exposures are calculated by prorating the total cumulative dose over a lifetime (also called lifetime average daily dose). The approach for carcinogens is based on the assumption that a high dose of a carcinogen received over a short period of tome is equivalent to a corresponding low dose spread over a lifetime. The averaging time for carcinogens is 25,550 days (70 years x 365 days) and 10,950 days (30 years x 365 days) for noncarcinogens.

The acceptable level of risk for carcinogens has been changed from one in one million (10^{-6}) to one in one hundred thousand (10^{-5}). All criteria for carcinogens have been changed appropriately. The acceptable hazard quotient (HQ) for noncarcinogens has always been 1, although this parameter was not explicitly presented in the previous MERA equations. The HQ is the ratio of a single substance's exposure level over a specified time period to a reference dose for that substance derived from a similar exposure period. An HQ of 1 indicates that an exposure level greater than the reference dose is unacceptable.

The relative source contribution factor (RSC) of 20% remains a parameter within the equations for groundwater criteria for noncarcinogens to maintain consistency with the EPA and State of Michigan in their development of

drinking water standards. The 20% RSC represents a default value to be replaced with a chemical-specific value when data are available. The RSC has been eliminated from the equations for the direct contact soil criteria. (For additional discussion on the RSC, see Operational Memo #14.)

The exposure duration of 30 years represents a national upper-bound time (90th percentile) at one residence (EPA, 1989). The exposure frequency (EF) of 350 represents the number of days per year that a resident is exposed to drinking water at their home; it assumes that people spend approximately 15 days per year away from their homes for vacations or other reasons. Two separate EF values are used for exposure to soil, each specific to the ingestion and dermal routes of exposure.

For ingestion of soil, EPA guidance ("Standard Default Exposure Factors" OSWER Directive: 9285.6-03, March 25, 1991) recommends a daily intake rate of 200 mg/day for children aged 1-6 years and 100 mg/day for all others. These intake values are believed to represent upper-bound estimates of average soil ingestion rates.

The EPA-recommended soil ingestion rates account for ingestion of both outdoor soils and indoor dust. The values are derived primarily from fecal tracer studies which estimate the amount of soil ingested throughout a day's activities. As such, the intake rates are not event-specific (i.e. the rates do not represent the amount of soil ingested during outdoor activities). Data suggest that up to 80% of indoor dust consists of outdoor soils which have been brought into a residence by air deposition and foot traffic. Therefore, it may not be assumed that ingestion of contaminated soil is entirely precluded by climatic conditions such as snow cover.

There is no currently available method for determining the relative contribution of soil vs. dust to the daily total, or the effect of climatic conditions on the rate of soil ingestion. Therefore, a constant year round exposure is assumed and the appropriate EF value for ingestion of soil/dust for the residential soil direct contact criterion is 350 days per year.

The EPA recommends that local weather conditions such as snow cover be considered in determining the appropriate EF for dermal contact with soil. It is assumed that Michigan winters last for 4 months (120 days) making soil unavailable for contact. Therefore, the EF for dermal contact with soil for the residential soil direct contact criterion is 245 days per year (365-120).

Ingestion and dermal contact rates within the direct contact soil criterion equation are adjusted to account for both children and adults. It is assumed that during the 30 year exposure period, 6 years is spent as a child who ingests more soil/day and the remaining 24 years is spent as a child/adult ingesting less soil/day. The age-adjusted approach was previously used in the development of the Type B soil direct contact criteria (although the data and calculations were different) and is recommended by EPA (EPA, 1991).

The skin surface area for child and adult receptors in the age-adjusted dermal factor is equal to 25 percent of the 50th percentile of total skin surface area for the respective age group (EPA, 1992b). Dermal exposure to soil is expected to occur on the hands, arms, legs, neck and head, accounting for approximately 25% of the total skin surface area.

The absorption efficiencies are the same as those used previously. When chemical-specific data are not available, the absorption efficiency applicable

to ingestion (AE_i) shall be either 100% for volatile organic chemicals or 50% for other organic chemicals, polychlorinated biphenyls, pesticides, or inorganic parameters. When chemical-specific data are not available, the absorption efficiency applicable to dermal contact (AE_d) shall be either 10% for a volatile organic chemical or 1% for other organic chemicals, polychlorinated biphenyls, pesticides, or inorganic parameters.

This memo is intended to provide guidance to Division staff to foster consistent application of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451 and associated Administrative Rules. This document is not intended to convey any rights to any parties nor create any duties or responsibilities under law. This document and matters addressed herein are subject to revision.

Questions about values in the attached table should be directed to one of the ERD toxicologists: Christine Flaga, telephone 517-373-0160, Jeffrey Crum, telephone 517-335-3092, or Linda Larsen, telephone 517-335-3161. Other questions about this memorandum should be directed to District Supervisors.

Attachment
rev. 4

REFERENCES

EPA, 1992a. Supplemental Guidance to RAGS: Calculating the Concentration Term. OSWER Publication 9285.7-081. May, 1992.

EPA, 1992b. Dermal Exposure Assessment: Principles and Applications. Interim Report. EPA/600/8-91/011B. January, 1992.

PART 201 OF THE NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT, 1994
PA 451
GENERIC RESIDENTIAL CLEANUP CRITERIA FOR GROUNDWATER AND SOIL

(Revision 4)

sidential criteria were calculated using currently available toxicological data. These criteria may change as new toxicity data become vailable. They are not necessarily final cleanup standards. Please read the attached introduction for details. Carcinogenic chemicals are shown in bold italics. All values are expressed in units of parts per billion (ppb); ug/l in water and ug/kg in soil. Scientific notation is represented by E+ or E- a value, for example 2×10^6 is reported as 2E+6. Please refer to Operational Memorandum #6 for additional information concerning analytical methods and method detection limits.

	GROUNDWATER (ppb:ug/l)				SOIL (ppb:ug/kg)			
Chemical	Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	20X Drinking Water Value	20X GSI Value	Direct Contact Value	Target Method Detection Limit in Soil
Acenaphthene	1,300	NA	3.8	5	26,000	76	7.6E+7	330
Acenaphthylene	26	NA	(B)	5	520	(B)	1.5E+6	330
Acetaldehyde	950	NA	(B)	500	19,000	(B)	1.4E+7	2,500
Acetic acid	4,200	NA	(B)	18,000	84,000	(B)	6.3E+7	9.0E+5
Acetone	730	NA	25,000	100	15,000	5.0E+5	1.1E+7	100
Acetonitrile	140	NA	810	50	2,800	16,000	2.1E+6	100
Acrolein	120	NA	2.5	5	2,400	50	1.8E+6	10
Acrylamide	0.19	NA	9.1	0.5	3.8	180	2,200	5
Acrylic acid	3,900	NA	(B)	NA	78,000	(B)	5.8E+7	NA
rylonitrile	1.6	NA	2.2	1	32	44	4,700	10
Alachlor	2 (C)	NA	48	1	40	960	1.2E+5	20
Aldicarb	3 (C)	NA	(B)	2	60	(B)	4.2E+5	50
Aldicarb sulfoxide	4 (C)	NA	(B)	2	80	(B)	5.5E+5	50
Aldicarb sulfone	2 (C)	NA	(B)	2	40	(B)	4.6E+5	50
Aldrin	0.05	NA	0.0014	0.01	(E)	(E)	580	20
Aluminum	ID	50 (A,F)	(B)	100	1,000	(B)	ID	700
Ammonia	ID (P)	NA	20 (D)	50	ID (P)	400	ID (P)	1,000
Aniline	150	NA	4	20	3,000	80	1.7E+6	1,700
Anthracene	7,300	NA	1.1E+5	5	1.5E+5	2.2E+6	4.2E+8	330
Antimony	6 (A,C)	NA	50 (A)	5	120 (A)	1,000	1.5E+5	500
Arsenic	50 (A,C)	NA	11 (A)	5	1,000 (A)	220 (A)	5,500 (A)	100
Atrazine	3 (C)	NA	7.8	1	60	160	45,000	50
Azobenzene	7.7	NA	(B)	NA	150	(B)	90,000	NA
Barium	2,000 (A,C)	NA	630 (A,D)	200	40,000 (A)	13,000 (A)	3.0E+7	1,000
Benzene	5 (C)	NA	53	5	100	1,100	88,000	10
Benzidine	0.0037	NA	0.0054	50	0.074	0.11	43	1,000
Benzo(a)anthracene (Q)	1.2	NA	0.31	5	(E)	(E)	14,000	330
Benzo(b)fluoranthene (Q)	1.2	NA	0.31	5	(E)	(E)	14,000	330
Benzo(k)fluoranthene (Q)	12	NA	0.31	5	(E)	(E)	1.4E+5	330
nzo(g,h,i)perylene	26	NA	(B)	5	(E)	(E)	1.5E+6	330

	GROUNDWATER (ppb:ug/l)				SOIL (ppb:ug/kg)			
Chemical	Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	20X Drinking Water Value	20X GSI Value	Direct Contact Value	Target Method Detection Limit in Soil
Benzo(a)pyrene (Q)	0.2 (C)	NA	0.31	5	(E)	(E)	1,400	330
Benzoic acid	32,000	NA	(B)	50	6.4E+5	(B)	1E+9 (G)	3,300
Benzyl alcohol	10,000	NA	22	50	2.0E+5	440	1.6E+8	1,300
Benzyl chloride	5	NA	(B)	0.5	100	(B)	15,000	200
Beryllium	4 (C)	NA	(B)	1	80	(B)	2,300	200
Bis(2-chloroethoxy)ethane	ID	NA	(B)	5	ID	(B)	ID	330
bis(2-Chloroethyl)ether	0.77	NA	4.2	5	15	84	2,300	330
bis(2-Ethylhexyl)phthalate	6 (C)	NA	59	5	(E)	(E)	7.0E+5	330
Boron	440 (A)	NA	(B)	300	8,800 (A)	(B)	2.5E+7	8,000
Bromobenzene	ID	NA	(B)	1	ID	(B)	ID	10
Bromodichloromethane	100 (C,S)	NA	24	1	2,000 (S)	480	41,000	10
Bromoform	100 (C,S)	NA	65	1	2,000 (S)	1,300	3.2E+5	10
Bromomethane	10	NA	11	1	200	220	1.5E+5	10
n-Butanol	950	NA	(B)	800	19,000	(B)	1.4E+7	4,400
2-Butanone (MEK)	13,000	NA	7,200	50	2.6E+5	1.4E+5	2.0E+8	100
n-Butyl acetate	550	NA	40	10	11,000	800	8.3E+6	20
t-Butyl alcohol	3,900	NA	8,300	1,000	78,000	1.7E+5	5.9E+7	4,400
Butyl benzyl phthalate	1,200	NA	(B)	5	24,000	(B)	6.8E+7	330
Cadmium	5 (A,C)	NA	0.64 (A,D)	0.5	100 (A)	13 (A)	2.1E+5	50
Camphene	ID	NA	(B)	NA	ID	(B)	ID	NA
Caprolactam	5,800	NA	(B)	NA	1.2E+5	(B)	3.4E+8	NA
Carbaryl	700	NA	(B)	20	14,000	(B)	4.1E+7	1,000
Carbofuran	40 (C)	NA	1.6	20	800	32	5.5E+5	200
Carbon disulfide (R)	800	NA	(B)	50	16,000	(B)	1.2E+7	100
Carbon tetrachloride	5 (C)	NA	21	1	100	420	20,000	10
Chlordane	2 (C)	NA	0.00053	0.02	(E)	(E)	7,600	10
Chloride	ID	2.5E+5	(B)	10,000	5.0E+5	(B)	ID	2.0E+5
Chlorobenzene	100 (C)	NA	71	1	2,000	1,400	2.1E+6	10
Chloroethane	220	NA	(B)	1	4,400	(B)	6.7E+5	10
2-Chloroethyl vinyl ether	ID	NA	(B)	10	ID	(B)	ID	100
Chloroform	100 (C,S)	NA	80	1	2,000 (S)	1,600	4.2E+5	10
Chloromethane	66	NA	(B)	1	1,300	(B)	2.0E+5	10
4-Chloro-3-methylphenol	150	NA	4.4	5	3,000	88	2.2E+6	330
beta-Chloronaphthalene	1,800	NA	(B)	5	36,000	(B)	2.7E+7	330
2-Chlorophenol	45	NA	10	5	900	200	6.8E+5	330
o-Chlorotoluene	150	NA	(B)	1	3,000	(B)	2.2E+6	10
Chlorpyrifos	22	NA	0.002	0.2	440	0.04	1.3E+6	10
Chromium (III) (I)	100 (A,C,J)	NA	77 (A,D)	50	2,000 (A)	1,500 (A)	6.3E+8	2,500
Chromium (VI) (I)	100 (A,C,J)	NA	7.3 (A)	5	2,000 (A)	150 (A)	2.0E+6	200

	GROUNDWATER (ppb:ug/l)				SOIL (ppb:ug/kg)			
Chemical	Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	20X Drinking Water Value	20X GSI Value	Direct Contact Value	Target Method Detection Limit in Soil
Chrysene (Q)	120	NA	0.31	5	{E}	{E}	1.4E+6	330
Cobalt	37	NA	{B}	10	740	{B}	2.1E+6	500
Copper	1,400 {A}	1,000	18 {A,D}	25	20,000	360 {A}	1.6E+7	1,000
Cyanazine	1.5	NA	4.7	10	30	94	17,000	500
Cyanide (R)	200 {C}	NA	5.2	20	4,000	100	9.3E+6	500
Cyclohexanone	33,000	NA	{B}	50	6.6E+5	{B}	5.0E+8	100
Dacthal	73	NA	{B}	1	1,500	{B}	4.2E+6	20
Dalapon	200 {C}	NA	{B}	10	4,000	{B}	9.3E+6	100
4-4'-DDD	3.5	NA	0.0084	0.02	{E}	{E}	41,000	20
4-4'-DDE	2.5	NA	0.0059	0.02	{E}	{E}	29,000	20
4-4'-DDT	2.5	NA	0.00023	0.02	{E}	{E}	29,000	20
Decabromodiphenyl ether	73	NA	{B}	10	1,500	{B}	4.2E+6	100
Di-n-butyl phthalate	880	NA	12,000	5	18,000	2.4E+5	5.1E+7	330
Di(2-ethylhexyl) adipate	400 {C}	NA	{B}	5	8,000	{B}	2.1E+6	330
Di-n-octyl phthalate	130	NA	{B}	5	2,600	{B}	7.6E+6	330
Diacetone alcohol	ID	NA	{B}	NA	ID	{B}	ID	NA
Diazinon	1.3	NA	0.002	0.5	26	0.04	76,000	10
enzo(a,h)anthracene (Q)	0.12	NA	0.31	5	{E}	{E}	1,400	330
Dibenzofuran	ID	NA	{B}	5	ID	{B}	ID	330
Dibromochloromethane	100 {C,S}	NA	29	1	2,000	580	31,000	10
Dibromomethane	80	NA	{B}	5	1,600	{B}	4.6E+6	10
1,2-Dichlorobenzene	600 {C}	NA	7	1	12,000	140	9.4E+6	10
1,3-Dichlorobenzene	600 {C}	NA	180	1	12,000	3,600	9.4E+6	10
1,4-Dichlorobenzene	75 {C}	NA	15	1	1,500	300	1.1E+5	10
3,3'-Dichlorobenzidine	1.9	NA	0.063	20	38	1.3	5,700	2,000
Dichlorodifluoromethane	1,700	NA	{B}	1	34,000	{B}	2.5E+7	10
1,1-Dichloroethane	880	NA	{B}	1	18,000	{B}	1.3E+7	10
1,2-Dichloroethane	5 {C}	NA	560	1	100	11,000	28,000	10
1,1-Dichloroethylene	7 {C}	NA	32	1	140	640	1.1E+5	10
cis-1,2-Dichloroethylene	70 {C}	NA	{B}	1	1,400	{B}	1.2E+6	10
trans-1,2-Dichloroethylene	100 {C}	NA	300	1	2,000	6,000	1.9E+6	10
2,6-Dichloro-4-nitroaniline	2,200	NA	{B}	0.01	44,000	{B}	1.3E+8	0.1
2,4-Dichlorophenol	73	NA	34 {D}	5	1,500	680	4.2E+6	330
2,4-Dichlorophenoxyacetic acid	70 {C}	NA	47	10	1,400	940	4.2E+6	200
1,2-Dichloropropane	5 {C}	NA	64	1	100	1,300	38,000	10
1,3-Dichloropropene (J)	4.7	NA	3	1	96	60	14,000	10
Dichlorovos	2.9	NA	{B}	0.1	58	{B}	34,000	50
...yclohexyl phthalate	ID	NA	{B}	5	ID	{B}	ID	330
...ieldrin	0.053	NA	3.2E-5	0.02	{E}	{E}	620	20

	GROUNDWATER (ppb:ug/l)				SOIL (ppb:ug/kg)			
Chemical	Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	20X Drinking Water Value	20X GSI Value	Direct Contact Value	Target Method Detection Limit in Soil
Diethoxymethane	ID	NA	(B)	10	ID	(B)	ID	100
Diethyl ether	3,700	NA	(B)	50	74,000	(B)	5.5E+7	100
Diethyl phthalate	5,500	NA	1.2E+5	5	1.1E+5	2.4E+6	3.2E+8	330
Diethylene glycol monobutyl ether	88	NA	(B)	NA	1,800	(B)	5.1E+6	NA
Diisopropylamine	5.6	NA	(B)	NA	110	(B)	85,000	NA
Dimethyl phthalate	73,000	NA	2.9E+6	5	1.5E+6	5.8E+7	1E+9 (G)	330
N,N-Dimethylacetamide	180	NA	(B)	NA	3,600	(B)	2.7E+6	NA
N,N-Dimethylaniline	16	NA	(B)	NA	320	(B)	2.4E+5	NA
Dimethylformamide	700	NA	3,800	NA	14,000	76,000	1.1E+7	NA
2,4-Dimethylphenol	370	NA	31	5	7,400	620	2.1E+7	330
2,6-Dimethylphenol	4.4	NA	(B)	5	88	(B)	2.5E+5	330
3,4-Dimethylphenol	10	NA	(B)	5	200	(B)	5.9E+5	330
Dimethylsulfoxide	2.2E+5	NA	(B)	NA	4.4E+6	(B)	1.0E+9 (G)	NA
2,4-Dinitrotoluene	1.3	NA	91	5	26	1,800	15,000	330
Dinoseb	7 (C)	NA	0.5 (D)	1	140	10	4.2E+5	20
1,4-Dioxane	77	NA	2,000	1	1,500	40,000	2.3E+5	10
Diquat	20 (C)	NA	(B)	1	400	(B)	9.3E+5	NA
Endosulfan (J)	1.7	NA	(B)	0.01	(E)	(E)	97,000	3.3
Endothall	100 (C)	NA	(B)	20	2,000	(B)	7.2E+6	NA
Endrin	2 (C)	NA	0.0023	0.02	(E)	(E)	72,000	20
Epichlorohydrin	86	NA	(B)	5	1,700	(B)	2.6E+5	10
Ethanol	2.0E+6	NA	41,000	1,000	4.0E+7	8.2E+5	1.0E+9 (G)	4,400
Ethyl acetate	6,600	NA	1,000	NA	1.3E+5	20,000	9.9E+7	NA
1-Ethyl-2-methylbenzene	ID	NA	(B)	NA	ID	(B)	ID	NA
Ethylbenzene	700 (C)	74	31	1	1,500	620	1.1E+7	10
Ethylene dibromide	0.05 (C)	NA	1.1	1	1	22	30	10
Ethylene glycol	15,000	NA	68,000	5,000	3.0E+5	1.4E+6	8.4E+8	5,000
Ethylene glycol acetate	ID	NA	(B)	NA	ID	(B)	ID	NA
Ethylene glycol monobutyl ether	95	NA	(B)	NA	1,900	(B)	1.4E+6	NA
Fluoranthene	880	NA	370	5	18,000	7,400	5.1E+7	330
Fluorene	880	NA	14,000	5	18,000	2.8E+5	5.1E+7	330
Fluorine	400 (C)	2,000	1,900	NA	8,000	38,000	2.5E+7	NA
Formaldehyde	1,300	NA	170	100	26,000	3,400	2.0E+7	500
Formic acid	10,000	NA	(B)	18,000	2.0E+5	(B)	1.5E+8	9.0E+5
1-Formylpiperidine	80	NA	(B)	NA	1,600	(B)	1.2E+6	NA
Gentian violet	8.5	NA	(B)	NA	170	(B)	99,000	NA
Glyphosate	700 (C)	NA	(B)	100	14,000	(B)	4.2E+7	NA
Heptachlor	0.4 (C)	NA	0.0016	0.01	(E)	(E)	2,200	20
Heptachlor epoxide	0.2 (C)	NA	0.0011	0.01	(E)	(E)	1,100	20

	GROUNDWATER (ppb:ug/l)				SOIL (ppb:ug/kg)			
Chemical	Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	20X Drinking Water Value	20X GSI Value	Direct Contact Value	Target Method Detection Limit in Soil
n-Heptane	32,000	NA	4	NA	6.4E+5	80	4.8E+8	NA
Hexabromobenzene	20	NA	(B)	(K)	400	(B)	1.2E+6	(K)
Hexachlorobenzene (C-66)	1 (C)	NA	0.0019	(K)	20	0.038	6,200	(K)
Hexachlorobutadiene (C-46)	11	NA	500	(K)	220	10,000	1.3E+5	(K)
alpha-Hexachlorocyclohexane	0.14	NA	0.13	0.01	2.8	2.6	1,600	20
beta-Hexachlorocyclohexane	0.47	NA	0.46	0.01	9.6	9.2	5,500	20
Hexachlorocyclopentadiene (C-56)	50 (C)	NA	0.54	(K)	1,000	11	3.0E+6	(K)
Hexachloroethane	61	NA	13	2	1,200	260	1.8E+5	50
n-Hexane	3,000	NA	(B)	NA	60,000	(B)	4.5E+7	NA
2-Hexanone	1,000	NA	(B)	50	20,000	(B)	1.5E+7	100
Indeno(1,2,3-cd)pyrene (Q)	1.2	NA	0.31	5	(E)	(E)	14,000	330
Iron	ID	300 (A)	(B)	100	6,000 (A)	(B)	ID	2,000
Isobutyl alcohol	2,300	NA	(B)	1,000	46,000	(B)	3.5E+7	4,400
Isophorone	900	NA	860	5	18,000	17,000	2.7E+6	330
Isopropyl alcohol	470	NA	21,000	400	9,400	4.2E+5	7.0E+6	4,400
Lead	4 (A,L)	NA	6.6 (A,D)	3	80 (A)	130 (A)	4.0E+5	1,000
Lindane	0.2 (C)	NA	0.08	0.01	4	1.6	7,600	20
gnesium	4.2E+5	NA	(B)	30	8.4E+6	1.0E+9	1.0E+9 (G)	3,000
Manganese	180 (A)	50 (A)	(B)	20	1,000 (A)	(B)	2.0E+6	2,000
Mercury (Inorganic)	2 (A,C)	NA	0.0013 (A)	0.2	40 (A)	0.026 (A)	1.3E+5	100
Methanol	3,700	NA	41,000	1,000	74,000	8.2E+5	5.5E+7	4,400
Methoxychlor	40 (C)	NA	(B)	0.5	80	(B)	2.1E+6	50
2-Methoxyethanol	29	NA	(B)	NA	580	(B)	4.4E+5	NA
2-Methyl-4-chlorophenoxyacetic acid	7.3	NA	(B)	0.5	150	(B)	4.2E+5	100
2-Methyl-4,6-dinitrophenol	2.6	NA	0.59	20	52	12	1.5E+5	1,700
4-Methyl-2-pentanone (MIBK)	370	NA	(B)	50	7,400	(B)	5.5E+6	100
Methyl-tert-butyl ether (MTBE)	240	NA	380	50	4,800	7,600	3.6E+6	100
N-Methyl-morpholine	20	NA	(B)	NA	400	(B)	3.0E+5	NA
Methylcyclopentane	ID	NA	(B)	50	ID	(B)	ID	500
4,4'-Methylene-bis-2-chloroaniline (M)	0.88	NA	(B)	1	(E)	(E)	10,000	50
Methylene chloride	5 (C)	NA	59	5	100	1,200	3.4E+5	10
2-Methylnaphthalene	ID	NA	(B)	5	ID	(B)	ID	330
2-Methylphenol	370	NA	38	5	7,400	760	5.5E+6	330
3-Methylphenol	370	NA	(B)	5	7,400	(B)	2.1E+7	330
4-Methylphenol	37	NA	6.2	5	740	120	2.1E+6	330
Metolachlor	160	NA	150	10	3,200	3,000	1.9E+6	50
Molybdenum	37 (A)	NA	800 (A)	10	740	16,000 (A)	2.1E+6	100
ohthalene	260	NA	29	5	5,200	580	1.5E+7	330
Nickel	100 (A,C)	NA	57 (A,D)	50	2,000 (A)	1,100 (A)	3.2E+7	1,000

	GROUNDWATER (ppb:ug/l)				SOIL (ppb:ug/kg)			
Chemical	Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	20X Drinking Water Value	20X GSI Value	Direct Contact Value	Target Method Detection Limit in Soil
Nitrate (P)	10,000 (C,P)	NA	(B)	100	2.0E+5 (P)	(B)	ID	NA
Nitrite (P)	1,000 (C,P)	NA	(B)	100	20,000 (P)	(B)	ID	NA
Nitrobenzene	3.4	NA	1,900	5	68	38,000	51,000	330
2-Nitrophenol	20	NA	(B)	5	400	(B)	1.2E+6	330
n-Nitroso-di-n-propylamine	0.12	NA	(B)	5	2.4	(B)	370	330
N-Nitrosodiphenylamine	170	NA	160	5	3,400	3,200	5.2E+5	330
Oxamyl	200 (C)	NA	(B)	NA	4,000	(B)	1.6E+7	NA
Oxo-hexyl acetate	73	NA	(B)	NA	1,500	(B)	1.1E+6	NA
Pendimethalin	880	NA	0.62	0.1	18,000	12	5.1E+7	20
Pentachlorobenzene	6.1	NA	(B)	2	120	(B)	3.5E+5	50
Pentachloronitrobenzene	55	NA	(B)	2	1,100	(B)	3.2E+6	50
Pentachlorophenol	1 (C)	NA	0.8 (D)	20	20	16	82,000	3,400
Pentane	ID	NA	(B)	100	ID	(B)	ID	1,000
2-Pentene	ID	NA	(B)	NA	ID	(B)	ID	NA
Phenanthrene	26	NA	(B)	5	520	(B)	1.5E+6	330
Phenol	4,400	NA	1,100	5	88,000	22,000	6.6E+7	330
Picloram	500 (C)	NA	(B)	10	10,000	(B)	3.0E+7	100
Piperidine	3.2	NA	(B)	NA	64	(B)	48,000	NA
Polybrominated biphenyls (J)	0.096	NA	(B)	NA	(E)	(E)	1,100	NA
Polychlorinated biphenyls (PCBs) (J,T)	0.5 (C)	NA	2.0E-5	0.2	(E)	(E)	2,300	330
Prometon	160	NA	(B)	0.5	3,200	(B)	9.3E+6	20
Propachlor	95	NA	(B)	1	1,900	(B)	5.5E+6	20
Propazine	200	NA	(B)	0.5	4,000	(B)	1.1E+7	20
Propionic acid	12,000	NA	(B)	100	2.4E+5	(B)	1.9E+8	6,700
Propyl alcohol	1,400	NA	15,000	NA	28,000	3.0E+5	2.1E+7	NA
Propylene glycol	1.5E+5	NA	1.9E+5	5,000	3.0E+6	3.8E+6	1.0E+9 (G)	5,000
Pyrene	550	NA	11,000	5	11,000	2.2E+5	3.2E+7	330
Pyridine	7.3	NA	20	20	150	400	1.1E+5	330
Selenium	50 (A,C)	NA	5 (A)	5	1,000 (A)	100 (A)	2.1E+6	500
Silver	34 (A)	100	0.1 (A)	0.5	680 (A)	2 (A)	2.0E+6	500
Simazine	4 (C)	NA	3.4	10	80	68	2.2E+6	40
Sodium	1.6E+5	NA	(B)	NA	3.2E+6	(B)	1.0E+9 (G)	NA
Styrene	100 (C)	NA	19	1	2,000	380	85,000	10
Sulfate	ID	2.5E+5	(B)	NA	5.0E+6	(B)	ID	NA
Tebuthiuron	510	NA	(B)	NA	10,000	(B)	3.0E+7	NA
2,3,7,8-Tetrabromodibenzo-p-dioxin (O)	(O)	NA	(O)	0.0001	(E)	(E)	(O)	0.01
1,2,4,5-Tetrachlorobenzene	2,500	NA	0.4	0.1	50,000	8	1.4E+8	20
2,3,7,8-Tetrachlorodibenzo-p-dioxin (O)	3E-5 (C)	NA	1.4E-8	1.0E-5	(E)	(E)	0.09	0.00[illegible]
1,1,1,2-Tetrachloroethane	33	NA	(B)	1	660	(B)	99,000	10

	GROUNDWATER (ppb:ug/l)				SOIL (ppb:ug/kg)			
Chemical	Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	20X Drinking Water Value	20X GSI Value	Direct Contact Value	Target Method Detection Limit in Soil
1,1,2,2-Tetrachloroethane	4.3	NA	32	1	86	640	13,000	10
Tetrachloroethylene	5 (C)	NA	22	1	100	440	50,000	10
Tetrahydrofuran	240	NA	3,300	1,000	4,800	66,000	3.6E+6	10,000
Thallium	2 (A,C)	NA	5.4 (A)	2	40 (A)	110 (A)	28,000	500
Toluene	1,000 (C)	790	110	1	16,000	2,200	2.4E+7	10
p-Toluidine	4.5	NA	(B)	NA	90	(B)	52,000	NA
Toxaphene	3 (C)	NA	0.0002	1	60	0.004	2,300	170
Triallate	95	NA	(B)	1	1,900	(B)	5.5E+6	20
Tributylamine	10	NA	(B)	NA	200	(B)	1.5E+5	NA
1,2,4-Trichlorobenzene	70 (C)	NA	22	5	1,400	440	6.3E+6	330
1,1,1-Trichloroethane	200 (C)	NA	120	1	4,000	2,400	3.1E+6	10
1,1,2-Trichloroethane	5 (C)	NA	65	1	100	1,300	45,000	10
Trichloroethylene	5 (C)	NA	94	1	100	1,900	1.6E+5	10
Trichlorofluoromethane	2,600	NA	580	1	52,000	12,000	3.8E+7	10
2,4,5-Trichlorophenol	730	NA	25	50	15,000	500	4.2E+7	1,700
2,4,6-Trichlorophenol	77	NA	27 (D)	5	1,500	540	9.0E+5	330
2(2,4,5-Trichlorophenoxy)propionic acid (N)	50 (C)	NA	21	1	1,000	420	3.2E+6	50
,3-Trichloropropane	42	NA	(B)	1	840	(B)	2.4E+6	10
1,1,2-Trichloro-1,2,2-trifluoroethane	2.0E+5	NA	33	NA	4.0E+6	660	1.0E+9 (G)	NA
Triethanolamine	3,700	NA	(B)	NA	74,000	(B)	5.5E+7	NA
3-Trifluoromethyl-4-nitrophenol	4,500	NA	32 (D)	NA	90,000	640	2.6E+8	NA
Trifluralin	110	NA	(B)	1	2,200	(B)	1.3E+6	50
2,2,4-Trimethyl pentane	ID	NA	(B)	50	ID	(B)	ID	500
2,2,4-Trimethyl-2-pentene	ID	NA	(B)	NA	ID	(B)	ID	NA
1,2,4-Trimethylbenzene	30	NA	22	1	600	440	4.5E+5	10
1,3,5-Trimethylbenzene	23	NA	26	1	460	520	3.4E+5	10
tris(2,3-Dibromopropyl)phosphate	0.47	NA	(B)	NA	9.4	(B)	5,500	NA
Urea	ID (P)	NA	(B)	400	ID (P)	(B)	ID (P)	20,000
Vanadium	64 (A)	NA	8 (A)	20	1,300 (A)	160 (A)	3.7E+6	1,000
Vinyl acetate	640	NA	(B)	50	13,000	(B)	9.7E+6	100
Vinyl chloride	2 (C)	NA	3.1	1	40	62	1,200	10
White phosphorus (R)	0.11	NA	(B)	NA	2.2	(B)	6,300	NA
Xylenes	10,000 (C)	280	59	3	5,600	1,200	2.0E+8	30
Zinc	2,400 (A)	5,000 (A)	81 (A,D)	20	48,000 (A)	1,600 (A)	1.4E+8	1,000

Footnotes

{A} Background, as defined in Rule 701(c), may be substituted if higher than the cleanup criteria.

{B} Chemical has either not been evaluated or an inadequate data base precludes the development of a GSI value. Contact an ERD toxicologist for assistance.

{C} State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976 used as the default.

{D} GSI value is pH, temperature, or water hardness dependent. Contact an ERD toxicologist for details.

{E} Chemical, due to its physicochemical properties, is not expected to leach through soils to groundwater under most conditions.

{F} Professional judgment used to determine that 50 ppb of aluminum in drinking water is protective of human health.

{G} Criteria exceeds 100% in soil, hence it is reduced to 100%.

{H} Criteria is based on agricultural impacts (phytotoxicity), not 20X groundwater criterion.

{I} Valence-specific chromium data (Cr III and Cr VI) must be compared to the same valence-specific cleanup criteria. If analytical data are provided for "total" chromium only, then values for chromium VI must be applied as the cleanup criteria. Chromium III cleanup criteria can only be used at sites where groundwater is prevented from being used as a public water supply, currently or in the future.

{J} Chemical may be present in several isomer forms. Isomer specific concentrations must be combined for comparison to criteria. Contact an ERD toxicologist for further explanation.

{K} Two different analytical methods and target method detection limits are available for this chemical. Refer to Operational Memorandum #6 for details.

{L} Criteria developed using the U.S. EPA Integrated Uptake Biokinetic Model for children. No risk assessment method(s) is currently available to evaluate lead toxicity in adults. Higher level may be acceptable if soil concentration is less than 400 ppm and groundwater migrating off-site will not impact adjacent properties. Contact an ERD toxicologist for further explanation.

{M} Also known as MBOCA.

{N} Also known as Silvex.

{O} Use 2,3,7,8-TCDD "toxicity equivalence factors" (TEFs) for other chlorinated and /or brominated dibenzo-p-dioxins and chlorinated and/or brominated dibenzofurans for comparison to cleanup criteria. Contact an ERD toxicologist for details.

{P} All potential sources of nitrogen-nitrate must be combined and compared to nitrate criteria. Contact an ERD toxicologist for details.

{Q} Criteria for carcinogenic polynuclear aromatic hydrocarbons (PAHs) were developed using "relative potential potencies" (RPPs) to benzo(a)pyrene.

{R} Chemical may be reactive in soil.

{S} Concentrations of trihalomethanes in groundwater must be combined to determine compliance with the health-based drinking water value of 100 ppb.

{T} Toxic Substances Control Act, Subpart G - PCB Spill Cleanup Policy standards may be more restrictive.

ID = Inadequate data to develop criterion; NA = Not available.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

January 5, 1995

Jackson District
ERD

JAN 1995
RECEIVED
DNR-DISTRICT 13

TO: Environmental Response Division Staff

FROM: Alan J. Howard, Chief, Environmental Response Division

SUBJECT: **MERA Operational Memorandum #12, Revision #2:** Alternate Soil Leaching Procedures

This memorandum identifies certain laboratory methods which may be used in lieu of the Toxicity Characteristic Leaching Procedure (TCLP) to demonstrate compliance with the MERA Administrative Rule 299.5711(2). Subrule (a) of that rule states that the TCLP shall be an acceptable leaching test method to determine potential impacts of soil contaminants on groundwater. Subrule (b) of that rule allows other methods to be approved by the Department if they more accurately simulate conditions at the site than the TCLP. A number of alternative leaching tests have been reviewed and determined to be acceptable for the applications specified in the attached table. Further review of these methods is not required if such methods are used for a hazardous substance that is in a category noted "appropriate" on the attached table. The list of alternative methods will be updated as additional methods are approved.

Proposals for other standard methods and/or other applications of the approved methods may be considered. Modifications of the standard methods are generally not acceptable (e.g., the use of precipitation collected at the site as a leaching medium). Other proposed methods must be well documented, reproducible, and simulate soil leaching. Preference will be given to methods developed by the U.S. Environmental Protection Agency or national organizations, such as the American Society for Testing and Materials (ASTM).

The attached table lists appropriate soil leaching methods. The table includes "totals" tests as a reminder that it may be useful to initially screen soil samples for total (i.e., not just leachable) concentrations to determine if R 299.5711(2) is satisfied by virtue of total concentrations being less than 20 times the groundwater criterion. Please note, however, that the concentration remaining in soils may not exceed Type B Direct Contact Values regardless of the leachate concentration. Furthermore, since many TCLP waste characteristic regulatory levels are less than Type B Direct Contact Values, soils which exceed the TCLP regulatory levels should be managed according to the Hazardous Waste Management Act, 1979 PA 64, as amended.

Since the TCLP method was developed for application in another context, it may sometimes be too aggressive to accurately simulate site conditions. However, it is widely available and often useful as a "first-cut" leaching procedure. If the TCLP results exceed the groundwater cleanup criteria, other leaching methods may be used to demonstrate that a higher concentration of hazardous substance may be left in the soil without unacceptable groundwater impacts. Alternative methods listed in the attached table may be selected in lieu of the TCLP (i.e., it is not necessary to "fail" the TCLP before selecting another appropriate method).

This memorandum is intended to provide guidance to Division staff to foster consistent application of the Michigan Environmental Response Act, 1982 PA 307, as amended, and the administrative rules promulgated thereunder. This document is not intended to convey any rights to any parties or create any duties or responsibilities under the law. This document and matters addressed herein are subject to revision.

Questions about this memorandum should be directed to either Ralph Curtis at 517-373-8389 or George Jackson at 517-335-0223.

Attachment

rev. 2

TEST METHOD	EXTRACTION FLUIDS(S)	APPROPRIATE FOR:	INAPPROPRIATE FOR:
"Totals" methods	As per each analytical method	All, see MERA Operational Memo #6 for correct methods	
Toxicity Characteristic Leaching Procedure (TCLP) EPA Method 1311[1]	Buffered Acetic Acid, pH 2.88 or 4.93	metals, semi-volatiles, pesticides, PCBs, volatiles	cyanide, sulfides, hexavalent chromium
Synthetic Precipitation Leaching Procedure (SPLP) EPA Method 1312	Fluid #1: H_2SO_4 & HNO_3 @ pH 4.20	Extraction Fluid #1: metals, semi-volatiles, pesticides, PCBs	
	Fluid #3: Reagent Water	Extraction Fluid #3: cyanide, sulfides, volatiles, hexavalent chromium	
ASTM D3987-85 (ASTM Neutral Leach)[2]	Reagent Water	semi-volatiles, pesticides, PCBs cyanide, sulfides, hex. chromium	metals, volatiles
ASTM D5233-92 (ASTM Single Batch)[1,3]	Buffered Acetic Acid, pH 2.88 or 4.93	metals, semi-volatiles pesticides, PCBs	volatiles, cyanide, sulfides, hexavalent chromium

Notes:

1. Sodium in Method 1311 (TCLP) and the ASTM Single Batch extraction fluids may interfere with analysis of certain metals analyzed by graphite furnace procedures and thereby prevent attainment of Act 307 target detection levels. To avoid interference with sodium, non-furnace analytical methods and/or a leachate procedure which does not contain sodium (e.g., Method 1312) may be used.

2. The ASTM Neutral Leach Procedure provides for reporting the leachable contaminant levels in terms of the weight of the soil (mg/Kg). However, in order to use this soil leaching procedure for the purpose of evaluating contaminant mobility and potential impact on groundwater, leachable contaminant levels must be reported in terms of the volume of the leaching fluid (ug/l or mg/l). This requirement must be conveyed to the lab prior to sample analysis.

3. Method useful for large particle-sized materials. Any monolith subject to this method must also be evaluated with ASTM D4842-89 to evaluate freeze-thaw effects.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

June 6, 1995

TO: Environmental Response Division Staff

FROM: Alan J. Howard, Chief, Environmental Response Division

SUBJECT: **Environmental Response Division Operational Memorandum #14 Revision 2:** Remedial Action Plans Using Generic Industrial or Generic Commercial Cleanup Criteria and Other Requirements

THIS DRAFT, INTERIM OPERATIONAL MEMORANDUM HAS BEEN PREPARED TO FACILITATE IMPLEMENTATION OF THE 1995 AMENDMENTS TO PART 201 OF THE NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT, 1994 PA 451 (FORMERLY THE MICHIGAN ENVIRONMENTAL RESPONSE ACT). THIS OPERATIONAL MEMORANDUM WILL TAKE EFFECT *ONLY* WHEN HOUSE BILL 4596 IS SIGNED INTO LAW. INTERNAL REVIEW OF THIS MEMORANDUM IS ON-GOING, AND NO OUTSIDE REVIEW HAS BEEN COMPLETED. THE CONTENT OF THE MEMORANDUM, AND THE ATTACHED CRITERIA, ARE SUBJECT TO CHANGE AND SHOULD BE RELIED UPON ONLY AFTER CONFIRMATION WITH APPROPRIATE ERD STAFF.

Revision 2 of this Operational Memorandum reflects changes made as a result of two major legislative actions: (1) the incorporation of the Michigan Environmental Response Act (MERA), 1982 PA 307, as amended, (2) into the Natural Resources and Environmental Protection Code, 1994 PA 451; and the 1995 amendments to Part 201 contained in [House Bill 4596]. Enactment of the Natural Resources and Environmental Protection Act resulted in new section numbers for all of the former MERA, but did not make any substantive changes in the law. [House Bill 4596] substantially amends Part 201. Those amendments, particularly the changes in cleanup standards, are reflected in this revision of Operational Memorandum #14. Unless otherwise noted, Section references in this memorandum are to Part 201 of Act 451.

This memorandum provides direction in the preparation and review of generic industrial and commercial land use remedial action plans (RAPs) to comply with Section 20120A(1)(B) and (D). The following information highlights some important aspects of generic land use cleanups:

- The preparation, review and approval of RAPs based on the generic industrial/commercial approach is anticipated to require less effort than a site-specific RAP for most sites. In general, it will not be necessary to develop site-specific cleanup criteria for those sites which can be appropriately and completely addressed with these generic criteria.

- Site-specific RAPs are also an option under Section 20120A(2). Site-specific RAPs require the development of exposure assumptions that are representative of the activities of human receptors at the site. Site-

specific direct contact cleanup criteria may be developed by appropriately adjusting the exposure assumptions in the generic algorithms. Justification must be provided for the site-specific exposure assumptions identified.

- If a RAP relies on the attached generic risk assessment algorithms and criteria, the RAP must include a statement confirming that the generic exposure assumptions are representative of, or exceed, the expected exposure of workers at the site.

- In identifying which generic cleanup criteria are appropriate for a site, primary consideration should be given to the human receptors and the kinds of activities in which they engage. Land-use specific criteria can be used for a site not typically categorized under that specific land use, as long as the exposures do not exceed those identified in the algorithm used to derive the criteria.

- These generic industrial and commercial criteria apply only to the assessment of human health risks for workers at these sites. The need for assessment of off-site human health risks will be determined based on an evaluation of exposure potential for off-site receptors.

The direction provided in this memo is intended to facilitate the preparation of RAPs by setting forth the Environmental Response Division's (ERD) expectations for the human health risk assessment assumptions which are used to generate acceptable cleanup criteria for specific land uses. Additional information about the applicability of this approach and the criteria listed in the attached tables follows.

The attached sections on the land use-specific categories explain the basis for the exposure assumptions used in the generic approaches. In general, the exposure assumptions were established to be protective for a "reasonable maximum exposure" (RME) of a worker under the scenarios established. The RME is defined as the highest exposure that is reasonably expected to occur at a site. These exposure assumptions would also be protective of other workers at the facility who are outdoors less often. If the workers at a commercial or industrial property have a greater exposure potential (e.g., the exposure duration or exposure frequency is greater than that assumed in the generic algorithms), a site-specific RAP which reflects the exposure potential at the site should be submitted. This can be done by adjusting the exposure assumptions within the generic equation.

The criteria in the attached tables have been calculated by ERD toxicologists for the convenience of parties preparing generic industrial or commercial RAPs. The criteria are not maximum allowable criteria; they are concentrations that may be allowable for exposure in certain industrial or commercial settings. Higher concentrations may be approved as part of a limited industrial/commercial RAP if exposure barriers or engineering controls prevent or limit exposure. The criteria in the tables can be used as a screening tool to determine which areas of a site may be addressed by land use restrictions alone, and which require additional remediation or control.

The values in the table are useful in determining acceptable concentrations protective of human health through exposure pathways characterized by standardized assumptions. The text of the attachment describing the

algorithms includes discussions of other human exposure pathways which may require additional consideration in exceptional circumstances (e.g., inhalation pathway if a hazardous substance present in shallow soils is a carcinogen via inhalation but not ingestion or risks from contaminated subsurface materials to construction workers). When these special circumstances exist, contact an ERD toxicologist for guidance.

Generic Industrial and Commercial Cleanup Criteria
Groundwater and Soil Direct Contact

The attached tables list the generic industrial and commercial site criteria in a format similar to the table of residential criteria in Operational Memorandum #8. The applicability of values from the generic commercial and industrial tables may vary depending, for example, on site characteristics, reasonably foreseeable groundwater use, and the nature of the remedy being proposed. Additional guidance on the applicability of values from the chart follows.

HEALTH-BASED AND AESTHETIC DRINKING WATER CRITERIA
These criteria apply to groundwater in an aquifer. The RAP should identify whether each saturated zone underlying the site is an aquifer. Any formation which serves or may serve as a drinking water source meets the definition of "aquifer" in R 299.5101(c). Cleanup criteria for groundwater not in an aquifer must be determined by consideration of potential public health and environmental impacts associated with contamination of that groundwater (see discussion of Groundwater/Surface Water Ihterface Values below).

The health-based values in the attached table were calculated using the generic land use algorithms which are designed to protect workers whose drinking water is from an on-site groundwater source. If groundwater is the source of drinking water at the property, and the values in the table are exceeded, a remedial action to address groundwater will be necessary. If a state drinking water standard is available for an on-site contaminant, the drinking water standard overrides the health-based criterion and becomes the cleanup goal. In addition, if the affected groundwater is the source of drinking water at the industrial/commercial site, the aesthetic criterion (as defined by R 299.5709(2)(c) or (d)) must be met if that criterion is more restrictive than the health-based-criterion unless an assessment is presented that justifies an alternative criterion. The state drinking water standard would not, however, override a more restrictive aesthetic criterion. This assures that the groundwater will not be unusable because of aesthetic impacts. If groundwater is not the source of drinking water at the property, but it is or may be the source for off-site drinking water, then the need for remedial action to address the groundwater would be determined by other rules (e.g., R 299.5709). Groundwater beyond the property boundary would need to be addressed either by remediation or exposure controls.

Consider this example: A RAP using the generic criteria is proposed for an industrial site where groundwater is used as the source of drinking water for that facility and for private wells off-site. The groundwater concentrations on site (current and expected concentrations, based on information about migration potential developed during the Remedial Investigation and explained in the RAP) do not exceed the applicable drinking water criteria in the attached table. Remedial actions to address on-site groundwater would be

determined by the requirements of R 299.5705(5) and (6) (unless the Department makes a finding pursuant to Section 20118(5) and (6) that compliance with those subrules is not required) and/or compliance with GSI criteria. However, if hazardous substance concentrations in groundwater exceed the generic residential criteria at the industrial site boundary, groundwater remediation or exposure controls, or both, may be required to address potential off-site risks.

GROUNDWATER SURFACE WATER INTERFACE (GSI) CRITERIA
The GSI values included in the attached table are the same GSI values as presented in Op Memo #8. See Op Memo #8 for a complete explanation of GSI values. The GSI values are included here because they define the maximum allowable hazardous substance concentration at the groundwater surface water interface or at the edge of the mixing zone, whichever is applicable for a specific site, in industrial/commercial situations as well as residential situations. This is a function of applicable requirements of Part 31 of Act 451. Judgments about the applicability of GSI values and the compliance point for GSI criteria are the same for residential and commercial/industrial situations.

Prior to passage of the 1995 amendments, a mixing zone was not allowed when assessing the impact of groundwater venting to a surface water. A mixing zone is now allowed for venting groundwater at those sites where an additional load to the receiving stream of site-specific contaminants is allowable and where a mixing zone is appropriate for the receiving stream. If a RAP allows for venting groundwater, the discharge must comply with requirements of Part 31 of Act 451 and the relevant rules promulgated under that Part.

TARGET METHOD DETECTION LIMITS IN WATER AND SOIL
The values in these columns are identical to those in Operational Memorandum #8 and Operational Memorandum #6. See Op Memo #6 for a complete explanation of "target method detection limits" and analytical methodology.

SOIL CRITERIA PROTECTIVE OF GROUNDWATER
The determination of a soil concentration protective of groundwater in an aquifer can be more complex at industrial/commercial sites than for some residential sites, consequently, these values are not presented on the list. If groundwater contamination is confined (and will remain) on-site, and the groundwater at the site is used as a source of drinking water, then the soil cleanup criteria protective of groundwater can be determined in one of the following ways: 1) through the use of leachate test (see Operational Memorandum #12), comparing the leachate results to the industrial/commercial health-based drinking water value or aesthetic value, whichever is more restrictive, or if available, the state drinking water standard (unless the aesthetic criterion is more restrictive); 2) by comparing the concentration in soil (i.e., measured as a total, not leachable concentration) to 20 times the appropriate groundwater criterion; or 3) by the use of other methods, such as fate and transport modeling or perched in-situ groundwater evaluation, that demonstrate that hazardous substances in soil will not result in relevant groundwater criteria being exceeded. However, if off-site groundwater is or may be used as a source of drinking water, the groundwater must meet residential criteria at the property boundary or exposure controls must be provided. In that case, on-site soils may need to be cleaned up to a level more restrictive than that described above in order to assure that residential

criteria will be met at the appropriate location, unless groundwater remediation is being used to achieve the residential groundwater criteria off-site. It is possible that acceptable soil criteria protective of groundwater may vary across the site.

For certain chemicals which strongly adsorb to soil and are known not to leach at significant concentrations (i.e., PCBs, carcinogenic polynuclear aromatic hydrocarbons and some chlorinated pesticides), the direct contact value is accepted as the soil cleanup criterion to protect groundwater in addition to the protection against long-term, systemic, direct contact hazards. However, there are certain situations (i.e., presence of solvents or collection of unfiltered groundwater samples) which could result in the presence of these types of materials in groundwater. These other conditions should be evaluated before a chemical is considered nonmobile in soil. Consult an ERD toxicologist if you think direct contact values for other contaminants would be protective of groundwater or if you have questions about conditions that could cause the transport of a nonmobile contaminant through soil.

SOIL CRITERIA PROTECTIVE OF SURFACE WATER

The default values are shown in Op Memo #8 as 20 times the GSI value. If the GSI value is the controlling factor for groundwater and/or aquifers at an industrial/commercial site, the 20 times GSI value would be applied here in the same way it would be at a residential site. See Operational Memorandum #8 for a full discussion of this issue. Since the GSI value applies only at the groundwater surface water interface it is not necessary that soil concentrations throughout the site be less than or equal to 20 times the GSI number. However, in some cases, it may be simplest to make this comparison in judging the need for soil remediation to protect surface water. Generic industrial/commercial soil cleanup criteria protective of surface water can be developed using the same approaches that apply to the soil criteria protective of drinking water (i.e., leachate tests, 20 times water concentrations, comparison of perched water quality to GSI values or fate and transport modeling). This accounts only for leaching of hazardous substances from soil into groundwater and the subsequent impact of that groundwater on surface water. If there is significant potential for runoff to carry contaminated soil into surface water (i.e., this pathway is pertinent in the risk assessment), the impact of that runoff should be characterized in the risk assessment using fate and transport modeling. This type of analysis may be necessary in cases where the hazardous substances present at the site are highly persistent and/or bioaccumulative, since transport of substances with these properties may result in unacceptable impact on surface water sediments or in the food chain.

DIRECT CONTACT CRITERIA

These values protect workers at the site against long-term, systemic health effects from ingestion and dermal absorption of hazardous substances in soil. The exposure assumptions used in the algorithms are discussed in the generic industrial and commercial sections. The generic land-use direct contact criteria are applied like the residential direct contact values, except that the requirement that direct contact concentrations be met throughout the affected media will not always apply to industrial/commercial cleanups. It is possible for a generic industrial/commercial RAP to combine the application of these values for shallow soils and land use restrictions to protect against exposure to higher concentrations in deeper soils to provide for a remedy that is, when considered in total, protective of public health. In general,

surface soils are considered to be the top 0-6 inches, unless activities at a site indicate that a greater depth is more appropriate. However, unless use restriction are in place for contaminated subsurface materials, contaminant concentrations cannot exceed the appropriate soil concentration to protect public health.

Average on-site soil concentrations, represented as a 95% upper confidence level (UCL) on the arithmetic mean, may be used to determine compliance with the soil direct contact value. On-site 95% UCLs should, however, reasonably represent the areas over which exposures are expected to occur. Refer to EPA Guidance (EPA, 1992b) on appropriate methodology for calculating the 95% UCL.

ISSUES NOT ADDRESSED BY THE DIRECT CONTACT CRITERIA

Inhalation: Since all RAPs must document that they are protective of the public health, safety and welfare and the environment, they must contain some discussion of potential inhalation risks, and whether inhalation is a pertinent pathway for human exposure at the site in question. The direct contact criteria do not address and are not applicable for the inhalation pathway because they do not incorporate the potential inhalation effects, long-term or acute, of hazardous substances in soil.

In many cases, the inhalation pathway will be addressed by a simple description of the physical characteristics of the site such as pavement, vegetative cover, depth to contamination, or characteristics of on-site contaminants, which would allow for its elimination as a pertinent pathway. Characteristics of the contaminants that should be considered are vapor pressure and/or Henry's Law constant, the potential to cause cancer via the inhalation route, the potential to cause irritation of respiratory tissue and special characteristics which may make a contaminant an inhalation hazard (e.g., friable asbestos). The RAP should indicate whether any materials with these characteristics are present. If such materials are present, it may be necessary to conduct a risk assessment of the inhalation pathway, pursuant to Rules 299.5717(3)(a) and (f) in general, and to include criteria or exposure controls which are protective under the inhalation scenario. If not, criteria and/or exposure control measures which are protective for other routes of exposure will be deemed protective for the inhalation pathway and a narrative assessment for the inhalation pathway will be sufficient. EPA guidance should be followed when evaluating the inhalation pathway (EPA, 1991).

Dermal Toxicity: The direct contact soil equations do not address acute skin toxicity or skin sensitization. These concerns may have to be addressed before chemicals with these characteristics can be left in place at the direct contact concentration.

Ecological Concerns: Industrial/commercial RAPs also must address ecological concerns. The RAP should include a description of the physical setting of the site, including any natural resources which could be affected by the release(s) addressed in the plan. In general, potential ecological impacts are defined as adverse impacts on a community or a population of organisms rather than on an individual who is the focus of a human health risk assessment. An ecological risk assessment will be required only if there is a "sensitive environmental resource" (See Rule 299.5803(j)) present at or near the site, or if there are other special circumstances such as concern for persistent or bioaccumulative hazardous substances which may adversely effect the food chain, or a physical feature that would attract wildlife to the site

(e.g., migratory waterfowl habitat). Professional judgment must be used to determine whether it is likely that criteria more restrictive than those required to protect public health, or those required pursuant to other applicable regulations (e.g., groundwater/surface water interface criteria), are necessary to protect natural resources at or near the site. If ERD staff believe that there is a need for an ecological assessment, this should be reviewed with your supervisor and other technical experts as appropriate. Ecological risk assessments will be the exception rather than the rule.

Other Requirements for Industrial and Commercial RAPs

The generic industrial and commercial cleanup criteria will simplify the human health risk assessment component of the RAP when they are applicable. If the site meets the criteria for application of the generic approach, the human health risk assessment can consist of a comparison to the generic criteria when they are proposed for use at the site. If other criteria are proposed, they must be justified as protective of public health, safety, welfare and the environment. Regardless of whether generic or site-specific criteria are proposed, the RAP must also contain a demonstration that it satisfies all other requirements of Part 201 and the administrative rules, including applicable or relevant and appropriate requirements (ARARs) from other environmental laws. You should review Rules 299.5717, 299.5719 which contain requirements applicable specifically to industrial/commercial (formerly "Type C") cleanups. Also review Rules 299.5601 and 299.5603 which describe the factors the Department must consider in deciding whether to approve a RAP. Parties preparing industrial/commercial RAPs should directly and succinctly address how the RAP is responsive to all requirements of Rules 299.5601, 299.5603, 299.5717, and 299.5719 (or explain why the requirement is not applicable to the site).

Important components of an industrial/commercial RAP, in addition to the risk assessment, include:

- a thorough description of the proposed exposure controls (including a proposed restrictive covenant which addresses the factors called for in Rule 299.5719(3)). Exposure controls can be as simple as a commitment, through the restrictive covenant, that the land use of the site will remain consistent with the industrial or commercial risk assessment assumptions. More complex controls will be required if, for example, an engineered containment structure is part of the remedy.

- an explanation of how the proposed controls will be reliable, effective and satisfy other requirements of law.

- an operation and maintenance plan (see Rule 299.5517) and a monitoring plan (see Rule 299.5519), or both, if necessary. These plans may be conceptual (e.g., they need not specify manufacturers for equipment to be used, but must describe the function of the equipment). However, the plans must be presented in sufficient detail to allow us to judge their adequacy. The plans must also include cost estimates for implementation of the operation and maintenance and/or monitoring work. The cost estimates, which will be used, in part, to determine the amount of financial assurances required pursuant to Rule 299.5719(2), should be

based on work being done by contractor personnel rather than by employees of the party responsible for implementation of the RAP. This allows us to be confident that financial assurances would cover necessary costs if the state must take over these activities.

This memo is intended to provide guidance to Division staff to foster consistent application of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451 and associated Administrative Rules. This document is not intended to convey any rights to any parties nor create any duties or responsibilities under law. This document and matters addressed herein are subject to revision.

Questions about the generic industrial and commercial algorithms and criteria should be directed to ERD toxicologists (Chris Flaga, at 517-373-0160; Jeff Crum, at 517-335-3092; or Linda Larsen at 517-335-3161). Questions about other aspects of generic industrial and commercial RAPs should be directed to District Supervisors.

GENERIC INDUSTRIAL LAND USE CATEGORY

A generic industrial site will include sites with the following characteristics:

- The primary activity at the site is industrial in nature (e.g., manufacturing; utilities; industrial research and development; petroleum bulk storage) and access to the site is reliably restricted consistent with its use (e.g., by fences or security personnel or both). The term industrial site does not include farms, gasoline service stations or other commercial establishments where children may commonly be present. Inactive or abandoned sites are included if the property use was industrial, as described above.

- The current zoning of the property is industrial, the zoning is anticipated to be industrial (see below), or the RAP includes documentation that the current industrial use is a legal non-conforming use. This may include different zoning designations, depending on the community, such as "light industrial" or "heavy industrial". Documentation of zoning must be provided in the form of a map or current property record card which shows the zoning status of the site and all adjacent properties. If the RAP is based on anticipated zoning changes, discussion of this issue must indicate how and when the zoning changes are to be accomplished. The RAP must identify (preferably on a map) the nearest current residential land uses and nearest parcels which are zoned for residential use. Any non-conforming land uses in the vicinity of the site must be identified in the RAP (e.g., residential use on a parcel zoned "transitional industrial").

Generic Industrial Cleanup Criteria Algorithms

The following equations represent a reasonable and conservative approach for deriving generic cleanup criteria for an industrial facility. Assumptions are conservative to include a reasonable maximum exposure. The population protected are those industrial workers who spend a significant percentage of

their work time outdoors. Algorithms are presented for both the ingestion of groundwater and for direct contact with soil.

The generic industrial equations follow.

Generic Groundwater Algorithms:

CARCINOGENS: $$\frac{10^{-5} \times BW \times AT \times CF}{SF \times EF \times ED \times IR_{dw}}$$

where,

10^{-5} cancer risk	=	acceptable risk
BW (body weight)	=	70 kg
AT (averaging time in days)	=	25,550 (70 x 365)
CF (conversion factor)	=	1000 ug/mg
SF (cancer slope factor, mg/kg-d^{-1})	=	chemical-specific
EF (exposure frequency)	=	245 d/yr
ED (exposure duration)	=	21 yr
IR_{dw} (drinking water ingestion rate)	=	1 liter/day

NONCARCINOGENS: $$\frac{HQ \times RfD \times BW \times AT \times RSC \times CF}{EF \times ED \times IR_{dw}}$$

where,

HQ (hazard quotient)	=	1
RfD (oral reference dose, mg/kg/d)	=	chemical-specific
BW (body weight)	=	70 kg
AT (averaging time)	=	7,665 days (21 x 365)
CF (conversion factor)	=	1000 ug/mg
RSC (relative source contribution)	=	0.2
EF (exposure frequency)	=	245 d/yr
ED (exposure duration)	=	21 yr
IR_{dw} (drinking water ingestion rate)	=	1 liter/day
ED (exposure duration)	=	21 yr
IR_{dw} (drinking water ingestion rate)	=	1 liter/day

These equations yield values which represent concentrations of contaminants in water in units of parts per billion (ppb) or micrograms per liter (ug/l). To convert to units of parts per million (ppm) or milligrams per liter (mg/l) in water, divide by 1,000.

The selection of an appropriate averaging time (AT) is dependent upon the type of toxic effect being evaluated. EPA guidance is followed on this issue (USEPA, 1989; USEPA, 1991). AT represents the number of days over which the exposure is averaged. When evaluating long-term exposure to noncarcinogenic compounds, exposures are calculated by averaging over the period of exposure (i.e., subchronic or chronic exposures). For carcinogenic compounds, exposures are calculated by prorating the total cumulative dose over a lifetime (also called lifetime average daily dose). The approach for carcinogens is based on the assumption that a high dose of a carcinogen received over a short period of time is equivalent to a corresponding low dose spread over a lifetime. The averaging time for carcinogens is 25,550 days (70 years x 365 days) and 7,665 days (21 years x 365 days) for noncarcinogens.

MDNR's recommendation of 21 years as the exposure duration (ED) for a worker is based on 1991 statistics from the U.S. Dept. of Labor. However, since the Dept. of Labor statistics did not detail the distribution for employees

working greater than 19 years at one location, the EPA 95th percentile estimate of 25 years was assumed. The 90th percentile was estimated to be 21 years. Although an ED of 21 years differs from EPA's recommendation of 25 years, our value represents more recent data. In addition, we follow general EPA guidance which recommends using a combination of exposure assumptions which represent 50th, 90th and 95th percentiles.

The exposure frequency (EF) for the drinking water scenario is derived assuming 260 work days per year minus 3 work weeks (15 days) of vacation and sick time. The assumed amount of water ingested at work (1 liter/day) is based on EPA's recommendation (USEPA, 1991). It is pointed out, however, that workers engaged in hard, physical labor could ingest a greater volume of water and this should be considered before finalizing the criteria to be used at a specific site.

The RSC of 0.2 (20%) assumes that a worker gets 80% of his/her exposure to on-site contaminants from other sources. The RSC represents a default value, and if chemical-specific data are available, they should be used in place of the default. Use of the RSC is consistent with the algorithms for the residential cleanup criteria. Justification for use of a RSC follows. There are many chemicals to which people are exposed through a variety of media and activities. For example, solvents, which are common industrial contaminants, are also commonly found in products routinely used by the general consumer. Ignoring exposures from other sources could underestimate the risk posed by that type of chemical. However, other chemicals may not occur at significant levels, or may not occur at all, outside of the work place. In light of the fact that chemical-specific data pertaining to this issue is extremely limited and significant exposures to certain chemicals do occur outside of the work place, it is necessary to identify a conservative default for this generic approach. As data suggesting something other than 20% becomes available, they will be incorporated into the chemical-specific criteria calculations.

An RSC is only used for groundwater criteria; it has been eliminated from the direct contact soil equations. It's use for the industrial/commercial scenario is consistent with the residential equations. A 20% RSC for groundwater criteria is consistent with the approach taken by U.S. EPA for establishing Maximum Contaminant Level goals (MCLg) for noncarcinogens (previously known as RMCLs). Twenty percent is used by EPA "as a reasonable approximation of the actual exposure and recognizes that this value may somewhat either overestimate or underestimate the actual drinking water contribution. EPA does not believe that it is appropriate to set the RMCL at 100 percent of the ADI, as drinking water is not the sole contributor to total exposure, and using 100 percent of the ADI would underestimate the other sources of exposure" (U.S. EPA, 1985). An RSC has also been incorporated into the Great Lakes Initiative risk assessment process and has been informally used by the Waste Management Division in establishing groundwater permit limits for noncarcinogens.

In those cases where a State Drinking Water Standard is available, it will replace the health-based drinking water criterion, unless a more conservative aesthetic criterion is available.

Generic Industrial Direct Contact Soil Criterion Algorithms

CARCINOGENS:

$$\frac{10^{-5} \times BW \times AT \times CF}{SF \times (EF \times FD) \times ED \times FC \times [(IR_s \times AE_i) + (SA \times AF \times AE_d)]}$$

where,

10^{-5} cancer risk	= acceptable risk
BW (body weight)	= 70 kg
AT (averaging time)	= 25,550 days
CF (conversion factor)	= 1E+9 ug/kg
SF (cancer slope factor, mg/kg-d^{-1})	= chemical-specific
EF (exposure frequency)	= 112 d/yr
ED (exposure duration)	= 21 yr
FC (fraction of soil contaminated)	= 1
IR_s (soil ingestion rate)	= 50 mg/day
AE_i (ingestion absorp. efficiency)	= (see text)
SA (skin surface area)	= 2570 cm^2/day
AF (soil adherence factor)	= 1.0 mg/cm^2
AE_d (dermal absorption efficiency)	= (see text)

NONCARCINOGENS:

$$\frac{HQ \times RfD \times BW \times AT \times CF}{EF \times ED \times FC \times [(IR_s \times AE_i) + (SA \times AF \times AE_d)]}$$

where,

HQ (hazard quotient)	= 1
RfD (oral ref. dose, mg/kg/day)	= chemical-specific
BW (body weight)	= 70 kg
AT (averaging time)	= 7,665 days
CF (conversion factor)	= 1E+9 ug/kg
EF (exposure frequency)	= 112 d/yr
ED (exposure duration)	= 21 yr
FC (fraction soil contam'd)	= 1
Ir_s (soil ingestion rate)	= 50 mg/day
Ae_i (ingestion absorp. efficiency)	= (see text)
SA (skin surface area)	= 2570 cm^2/day
AF (soil adherence factor)	= 1.0 mg/cm^2
AE_d (dermal absorption efficiency)	= (see text)

These equations yield values representative of concentrations of contaminants in soil in units of ppb or micrograms/kilogram (ug/kg). To convert to units of ppm or milligrams/kilogram (mg/kg) in soil, divide by 1,000.

The exposure frequency (EF) for the direct contact scenario was derived considering climatic factors (e.g., snow cover, frozen soil) and inclement weather conditions (e.g., rain) as well as variation in daily activities in which industrial workers participate. It is assumed that Michigan winters last for 4 months (120 days) making soil unavailable for contact. Allowing three weeks off for vacations and sick leave, and adjusting for a standard five day work week yields a maximum number of 160 days per year of industrial outdoor exposure in Michigan. The assumptions represent high-end values within a range of potential exposures.

$$365 - 120 - 21 \times 5/7 = 160$$

Data from the Air Quality Division indicate that, on average, precipitation exceeds 0.25 inch one day per week during the months of March through October. These data represent average values from a 30 year period, 1951 through 1980. It is assumed that rainfall which exceeds 0.25 inches makes working outdoors difficult. Incorporating this factor also assumes that this significant rainfall occurs during the work week and during the eight hour work shift, which may not always be the case. However, this assumption may be balanced or "corrected" by a few low temperature days or snow days in March or October which could prevent a worker from working outdoors. This factor results in the number of days per week which a worker comes into contact with soil to be reduced from 5 to 4.

Activity patterns of a reasonable maximum exposed worker are not likely to bring the individual into contact with bare soil each and every day, since many different duties may be performed at any given facility. As a conservative estimate, it is assumed that one half day per week is spent performing some activity which does **not** bring the worker into contact with bare site soil. The incorporation of this factor results in a reasonable maximum EF value of 3.5 days per week or 112 days per year.

$$160 \times 3.5/5 = 112$$

The soil ingestion rate recommended by MDNR is 50 mg/day, which follows EPA's recommendation for industrial/commercial workers.

The oral absorption efficiency default is assumed to be 100% for volatiles and 50% for semi- and nonvolatile chemicals. When chemical-specific data are available, they will be used in place of the defaults. This policy is consistent with the Type B algorithms.

The skin surface area was estimated in the following manner:

skin surface area (cm^2) =	u SA forearms	=	1140
	u SA face (1/2 head)	=	590
	u SA hands	=	840
			2570

The amount of exposed skin surface area identified represents an average scenario, realizing that at times a worker could have more or less skin exposed. For example, there may be times when a worker is working without a shirt and times when a worker may be working in a long-sleeved shirt and/or a coat. The average scenario assumes that a worker is working in a short-sleeved shirt and long pants with hair or a hat covering part of his/her head. This scenario estimates a skin surface area value of 2,570 cm^2/day. In addition to the above discussion, surface area is strongly correlated with body weight. Since the assumed body weight represents an average value, surface area should be represented by an average value as well.

The attenuation factor of 1.0 mg/cm^2 is the value recommended by EPA (EPA, 1991). After evaluating the available soil adherence studies, EPA concludes that all of the studies considered have uncertainties thereby making a recommendation difficult. The studies provide a possible range from 0.2 to 1.5 mg/cm^2. A conservative central value of 1.0 mg/cm^2 is recommended until better data are available.

The dermal absorption efficiency is assumed to be 10% for volatiles and 1% for semi- and nonvolatiles as assumed in the Type B algorithm. All absorption values represent defaults which will be replaced if chemical-specific data are or become available.

As indicated earlier, EPA provides general guidance on how to characterize exposures and risks when conducting risk assessments. For Superfund exposure assessments, intake and exposure values should be selected so that the combination of all variables results in an estimate of the reasonable maximum exposure (RME) for that pathway. The RME is the maximum exposure that is reasonably expected to occur at a site. Under this approach, some intake variables may not be at their individual maximum values, but when in combination with other variables, will result in estimates of the RME (USEPA, 1989). More recent EPA guidance (USEPA, 1992), recommends estimating the high end exposure by "...identifying the most sensitive parameters and using maximum or near-maximum values for one or a few of these variables, leaving others at their mean values". This guidance applies when only limited information on the distribution of the exposure or dose factors is available. The basis for this recommendation is that maximizing all variables will result in an estimate that is above the range of actual values seen in the population. The algorithms presented in this document follow EPA guidance by combining exposure assumptions which represent a mix of high-end and mid-range values. For example, when evaluating the direct contact equation, a 70 year life span, body weight and surface area all represent a 50th percentile, while the exposure duration of 21 years and the soil ingestion rate represent the 90th percentile.

Since no distributions exist for frequency of exposure to soil, it's difficult to estimate a value and its associated percentile. However, it's reasonable to assume that the value chosen (112 days) is representative of the higher end of the range of possible exposures. Data supporting the dermal contact rate is also lacking, making it difficult to estimate the percentile that it represents. Although we are using average skin surface area values as presented by EPA (USEPA, 1990), estimation of those areas which are exposed to soil is strictly based upon best professional judgment. Although a significant amount of uncertainty surrounds the estimated exposure frequency and the dermal contact rate, the exposure assumptions selected are reasonable and conservative for the purpose of developing state-wide, generic cleanup criteria for industrial facilities.

REFERENCES

Calabrese, E.J. et al. 1990. Preliminary adult soil ingestion estimates: Results of a pilot study. Reg. Toxicol. Pharmacol. 12:88-95.

GCA Corporation. 1985. Development of Statistical Distributions or Ranges of Standard Factors Used in Exposure Assessments. Final Report. Prepared for Office of Health and Environmental Assessment, Office of Research and Development, USEPA. August.

USEPA. 1985. Federal Register, Vol. 50, No. 219, Wednesday, November 13, 1985.

USEPA. 1989. Risk Assessment Guidance for Superfund. Volume I. Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002. December 1989.

USEPA. 1990. Exposure Factors Handbook. EPA/600/8-89/043.

USEPA. 1991. Risk Assessment Guidance for Superfund: Volume I--Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals). Interim. Publication 9285.7-01B. December 1991.

USEPA. 1992a. Memorandum: Guidance on Risk Characterization for Risk Managers and Risk Assessors. From: F. Henry Habicht II. February 26, 1992.

USEPA. 1992b. Supplemental Guidance to RAGS: Calculating the Concentration Term. OSWER. Publication 9285.7081, May 1992.

GENERIC COMMERCIAL LAND USE CATEGORY

The commercial land use category is extremely varied and broad, encompassing everything from day care centers and schools to gas stations and warehouse operations. The physical setting of commercial properties and the activities which workers and the general public engage in at these sites are also extremely variable. Given the breadth of the commercial land use category, it is impossible to assign a single set of "typical" or generic exposure assumptions to characterize the activities of all potentially exposed populations.

In order to facilitate the development of generic commercial criteria, the universe of commercial land uses has been divided into four subcategories based on factors which are critical to the assessment of potential risk. These factors include the potentially exposed populations (workers or general public) and the nature, duration, and frequency of the exposures likely to occur when people occupy, work at, visit, or patronize the site. The division of the commercial land use category into subcategories allows for some useful generalizations to be made.

A substantial degree of variability remains even within the subcategories of commercial land use. It will be the responsibility of the party proposing a remedy to demonstrate that the site and exposure setting is consistent with the characteristics of the subcategory closely enough to warrant use of the criteria. Similarly, the party proposing the remedy will have to describe in the RAP those measures that will be put in place (institutional controls, restrictive covenants, access restrictions, etc.) to assure that the exposure setting of the site is maintained consistent with the exposure characteristics of the subcategory. This will serve to guarantee that uses of the site which might yield unacceptable exposures will be precluded in the future. Conversely, land uses consistent with a subcategory may not possess exposures that are similar to those used to define the category. Proper characterization of those site-specific activities or exposures may warrant the use of generic criteria from another subcategory or category.

In the following sections, exposure assumptions protective for the set of site and exposure characteristics described below for subcategory III and IV sites have been developed. Some commercial subcategory III and IV sites may be located in or near residential areas and, therefore, may be used by other populations for purposes other than the intended commercial use (e.g. recreational). It may be inappropriate to apply the generic criteria developed for a given subcategory of commercial land use, if anticipated exposure from unintended uses exceeds the exposures assumed under that subcategory. Adjustments can be made to the exposure assumptions to represent these other uses or criteria for a more representative category can be used. Alternatively, the RAP may denote measures designed to preclude unintended uses.

For the purpose of determining if the generic commercial criteria presented in this memorandum are applicable, the party proposing a remedy must first determine that the site falls within the definition of commercial land use or that the site-related exposures are similar to those assumed for this category. The definition of commercial land use includes the following two elements:

- The primary activity at the site is commercial in nature (e.g., retail; warehouse; office/business space, etc.). This could include abandoned or inactive commercial facilities as long as they fit both the definition of a commercial facility and one of the subcategory definitions described below.

- The current zoning of the property is commercial, future zoning is anticipated to be commercial, or the RAP includes documentation that the current commercial use is a legal non-conforming use. This may include different zoning designations, depending on the community, such as "community commercial", "regional commercial", "retail", or "office-business". Documentation of zoning must be provided in the form of a map or current property record card which shows the zoning status of the site and all adjacent properties. If the RAP is based on anticipated zoning changes, discussion of this issue must indicate how and when the zoning changes are to be accomplished. The RAP must identify (preferably on a map) the nearest current residential land uses and nearest parcels which are zoned for residential use. Any non-conforming land uses in the vicinity of the site must be identified in the RAP (e.g., residential use on a parcel zoned "transitional commercial").

Caution should be used when categorizing sites on the basis of facility or business type. We expect that activities may vary considerably even among facilities of the same type. Activities and exposures should be the primary considerations when determining a land use category for a specific site.

If the site meets the definition of commercial land use, the party proposing the remedy must determine which of the four subcategories of commercial land use defined below is most representative of the exposure setting of the subject site. The subcategories and the features which define them are described below:

Subcategory I: This commercial land use subcategory is characterized by any use which is intended to house, educate, or provide care for children, the elderly, the infirm, or other sensitive subpopulations. The activities engaged in by these populations at the site are characterized by exposures of relatively significant duration and/or frequency approximating the magnitude of exposures used to develop the residential criteria. The site setting may include unpaved or landscaped areas containing contaminated surficial soils which may be frequented by potentially exposed populations (e.g. play areas). Any soil contaminants present may therefore be readily accessible to the resident populations. If relied on for drinking water, exposure to groundwater would also be significant. In addition, this subcategory of commercial land use is usually, but not always, located in or near residential areas and, therefore, may be used by other populations for purposes other than the intended commercial use (e.g. recreational). This subcategory could include, but is not limited to, the following uses:

- day care centers
- any form of educational facility
- hospitals, elder care facilities, and nursing homes.

Although a site-specific risk assessment may be conducted on sites within this category, no generic commercial cleanup criteria will be developed because in

most cases, the site setting and uses will warrant the application of residential criteria. There are forms of subcategory I commercial land uses that do not possess the exposure characteristics of the residential exposure setting, for example, long-term or convalescent care facilities where patients are not expected to come into contact with soils on a frequent basis. In such cases, site-specific cleanup criteria or criteria from another subcategory can be utilized with proper justification.

Subcategory II: This commercial land use subcategory is characterized by the following features. Access to the public is reliably restricted, consistent with its use, by fences, security, or both. Affected surficial soils are located in unpaved or landscaped areas that are frequently contacted by worker populations such as groundskeepers, maintenance workers, or other employees whose primary duties are performed outdoors. If site groundwater is relied on for drinking water, worker populations would receive half of their total exposure from on site drinking water.

This subcategory could include, but is not limited to, the following uses:

- large-scale commercial warehouse operations
- wholesale lumber yards
- building supply warehouses

The degree of exposure for such employees under Subcategory II property is assumed to be equivalent to the exposures used to model outdoor activities in the development of the generic industrial criteria. As a result, a unique set of generic criteria has not been defined for this subcategory of commercial land use. Sites which fall into this subcategory should be addressed through the application of the generic industrial criteria or through a site-specific risk assessment.

Subcategory III: A subcategory III commercial site is characterized by the following features. Access to the public is unrestricted, however, the general public's occupancy of the site is expected to be intermittent and significantly less in frequency and duration relative to the population working at the site. Although some of the activities for both worker populations and the general public at a subcategory III commercial site are conducted indoors, a significant component of their activity will likely be outdoers. Affected surficial soils are located in unpaved or landscaped areas that may be contacted frequently, primarily by the worker populations (as may be the cases at gas stations, auto dealerships or building supply warehouses with unpaved or landscaped areas). If site groundwater is relied on for drinking water, worker populations would receive about half of their total exposure from the site.

This subcategory could include, but is not limited to, the following uses:

- Retail gas stations
- Auto service stations
- Auto dealerships
- Retail warehouses selling the majority of their merchandise indoors but including some limited storage or stockpiling of materials in a rear yard (building supply, retail flower and garden shops not involving on site plant horticulture and excluding open air nurseries, tree farms and sod farms which would fall into an agricultural land use).

- Repair and service establishments including but not limited to, lawn mower, boat, snowmobile, or small appliance repair shops that have small outdoor yards.
- Small warehouse operations

Subcategory IV: A subcategory IV commercial site is characterized by the following features. Access to the public is unrestricted, however, the general public's occupancy of the site is intermittent in frequency and of short duration relative to the worker populations resident at the site (i.e. the frequency and duration of general public occupancy at the site is typified by the time necessary to transact business at a retail establishment or to receive personal services). The predominant activities performed by both workers and the general public at this type of commercial property are conducted indoors. Affected surficial soils are located in unpaved or landscaped areas that are contacted by worker populations on an occasional basis, such as outdoor break or eating areas. General public contact with these areas is anticipated to be significantly less than the worker's contact, both in terms of frequency and duration. If site groundwater is relied on for drinking water, worker populations would receive one-half of their total exposure at the site.

This subcategory could include, but is not limited to, the following uses:

- Professional offices (lawyers, architects, engineers, real estate, insurance, etc.)
- Medical/dental offices and clinics (not including hospitals)
- Banks, credit unions, savings and loan institutions, etc.
- Publicly owned office buildings
- Any retail business whose principal activity is the sale of food or merchandise within an enclosed building
- Personal service establishments which perform services indoors (health clubs, barber/beauty salons, mortuaries, photographic studios, etc.).

Generic Commercial Cleanup Criteria Algorithms

The following section provides justification for the exposure assumptions used under the generic commercial subcategories III and IV. The methods used to establish the generic commercial cleanup criteria for commercial subcategories III and IV are briefly summarized below.

Groundwater: The worker population was used to establish exposure parameters for the generic commercial groundwater criteria. Because workers are expected to spend the most time on site, their exposures are assumed to be greater than exposures to the general public. Protection of the more highly exposed population assures protection of the general public.

Unlike soil exposures, the exposure assumptions which serve as the basis for the generic groundwater criteria were not varied between subcategories (except for subcategory I which assumes the ingestion of 2 liters of water/day). No meaningful distinctions could be made between commercial land use subcategories and water ingestion rates. The exposure assumptions and the resulting groundwater criteria do not differ from those developed for the generic industrial scenario. Please refer to the narrative on groundwater

exposure assumptions in the generic industrial section for details. When available, State Drinking Water Standards serve as the ultimate drinking water criterion, unless a more restrictive aesthetic cleanup criterion is available.

Soil: The exposure assumptions used in the direct contact algorithms are protective for a "reasonable maximum exposure". The focus was the worker population within each subcategory that spends the largest amount of time outdoors engaged in activities that permit contact with affected soils. The worker population in both commercial subcategory III and subcategory IV represents the segment of the population within the subcategory with the highest potential exposures. Protection of less significantly exposed populations, like customers or workers who spend less time outdoors, is thereby assured.

Generic Commercial Direct Contact Soil Algorithm

The direct contact soil algorithm for the commercial scenario is the same as the industrial direct contact soil algorithm with the exception of different values for two exposure parameters, specifically, exposure frequency (EF) and the skin surface area (SA), and incorporation of an exposure time parameter. Please refer to the generic industrial section for details on the exposure assumptions that have not changed.

CARCINOGENS:

$$\frac{10^{-5} \times BW \times AT \times CF}{SF \times (EF \times FD) \times ED \times FC \times [(IR_s \times AE_i) + (SA \times AF \times AE_d)]}$$

where,

10^{-5} cancer risk	= acceptable risk
BW (body weight)	= 70 kg
AT (averaging time)	= 25,550 days
CF (conversion factor)	= 1E+9 ug/kg
SF (cancer slope factor, mg/kg-d^{-1})	= chemical-specific
EF (exposure frequency)	= (see text)
FD (fraction of work day)	= (see text)
ED (exposure duration)	= 21 yr
FC (fraction of soil contaminated)	= 1
IR_s (soil ingestion rate)	= 50 mg/day
AE_i (ingest. absorption efficiency)	= (see text)
SA (skin surface area)	= (see text)
AF (soil adherence factor)	= 1.0 mg/cm^2
AE_d (dermal absorption efficiency)	= (see text)

NONCARCINOGENS:

$$\frac{HQ \times RfD \times BW \times AT \times CF}{(EF \times FD) \times ED \times FC \times [(IR_s \times AE_i) + (SA \times AF \times AE_d)]}$$

where,

HQ (hazard quotient)	= 1
RfD(oral reference dose, mg/kg day)	= chemical specific
BW	= 70 kg
AT	= 7,665 days
CF	= 1E+9 ug/kg
EF	= (see text)
ED	= 21 yr
FD	= (see text)
FC (fraction soil contam'd)	= 1

Ir_s	= 50 mg/day
AE_i	= (see text)
SA	= (see text)
AF	= 1.0 mg/cm^2
AE_d	= (see text)

These equations yield values which represent concentrations of contaminants in soil in units of ppm or mg/kg. To convert to units of ppb or micrograms/kilogram in soil (ug/kg), multiply by 1,000.

Commercial Subcategory III

A typical receptor in this subcategory is a gas station attendant who must perform a combination of indoor and outdoor activities. The EF of 160 days/year was derived assuming that four months of winter would preclude an individual from coming into contact with soil. Rain and other inclement weather factors were not considered because it is assumed that this type of worker must still perform his/her outdoor duties. Allowing for three weeks off per year for vacations and sick leave and adjusting for a standard five day work week yields a maximum number of 160 days per year of potential exposure (i.e., 365 - 120 - 21 x 5/7 = 160). Having both indoor and outdoor responsibilities, this type of commercial worker is conservatively expected to spend four out of eight hours per work day outdoors. The FD parameter is equal to 0.5 (4/8 hours).

The area of skin exposed is assumed to be the same as for the generic industrial worker, 2570 cm^2/day. This assumes that the face, hands and forearms of the receptor are available for exposure, typified by a worker wearing a short-sleeved shirt and long pants.

Commercial Subcategory IV

The typical worker in this subcategory may be represented by an office worker who eats lunch and takes breaks outdoors. The EF was derived assuming that four months of winter would preclude an individual from coming into contact with soil. Allowing three weeks off for vacations and sick leave and adjusting for a standard five day work week yields 160 days/year. As in the generic industrial scenario, it is also assumed that it rains one day out of the week. This results in a value of 128 days/year. Since this type of receptor is outdoors only a small portion of the work day, reasonably 1.5 hours/day, a fraction of day parameter (FD) (1.5 hours out of 8) is incorporated into the algorithm. FD is equal to 0.19 (1.5/8).

This type of receptor is assumed to be a person with face, hands, forearms and lower legs exposed. This represents an individual wearing a short-sleeved shirt and a dress or skirt. The total skin surface area for these exposed areas is 4575 cm^2/day.

The assumed EF, FD, and SA values for the two commercial subcategories are summarized as follows:

	Exposure Frequency	Fraction of Day	Surface Area
Commercial Subcat. III	160	0.50	2570
Commercial Subcat. IV	128	0.19	4575

Attached as a table is a matrix presenting all commercial category and subcategory definitions and exposure assumptions. Use this table when trying to determine the most appropriate commercial land use subcategory for the site in question.

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Table 1. Definitions of industrial and commercial categories and commercial subcategories and associated exposure assumptions.

LAND USE CATEGORIES AND SUBCATEGORIES	EXPOSURE ASSUMPTIONS				
	Exposure Frequency (d/year)	Fraction of Day (unitless)	Exposure Duration (years)	Soil Ingestion Rate (mg/day)	Skin Surface Area (cm^2/day)
INDUSTRIAL primary activity is industrial; property has landscaped and/or unpaved areas maintained by employees on a regular basis or employees are present whose primary duties are performed outdoors; access to general public is restricted; zoning is industrial	≤112	≤1	≤21	≤50	≤2570
COMMERCIAL primary activity is commercial; access is unrestricted; zoning is commercial; see subcategories					
SUBCATEGORY I a property where children, the elderly, the infirm or other sensitive subpopulations are housed, educated or otherwise cared for, e.g., schools, nursing homes, day cares; residential cleanup required	≤365	≤1	≤70	≤90	varies for different age grps.
SUBCATEGORY II activities similar to those characterized in industrial category; industrial cleanup required	≤112	≤1	≤21	≤50	≤2570
SUBCATEGORY III property has landscaped or unpaved areas in which some employees will spend approximately half of their work time, e.g., gas station attendants	≤160	≤0.5	≤21	≤50	≤2570
SUBCATEGORY IV a property with unpaved or landscaped areas that will be frequented by employees on an occasional basis, e.g., outdoor eating areas	≤128	≤0.19	≤21	≤50	≤4575

PART 201 OF THE NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT, 1994
PA 451
GENERIC INDUSTRIAL AND COMMERCIAL CLEANUP CRITERIA
FOR GROUNDWATER AND SOIL

(REVISION 2)

These criteria were calculated using currently available toxicological data. Criteria may change as new toxcity data become available. They are not necessarily final cleanup standards. The determination of a soil concentration protective of surface water and/or groundwater in an aquifer is more complex than for residential sites, consequently, there are no values shown on the list. PLEASE READ THE ATTACHED OPERATIONAL MEMORANDUM FOR DETAILS. Carcinogenic chemicals are shown in bold italics. All values are expressed in units of parts per billion (ppb); ug/l in water and ug/kg in soil. (Values are converted from units of parts per million (ppm) as generated by algorithms). Scientific notation is represented by E+ or E- a value, for example 2×10^6 is reported as 2E+6. Please refer to Operational Memorandum #6 and #8 for information concerning method detection limits and residential cleanup criteria, respectively.

Chemical	GROUNDWATER (ppb:ug/l)				SOIL (ppb:ug/kg)			
	Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	Direct Contact Value: Industrial	Direct Contact Value: Commercial Subcategory III	Direct Contact Value: Commercial Subcategory IV	Target Method Detection Limit in Soil
Acenaphthene	3,800	NA	3.8	5	8.1E+8	1.0E+9 (G)	1.0E+9 (G)	330
Acenaphthylene	75	NA	(B)	5	1.6E+7	2.3E+7	5.4E+7	330
Acetaldehyde	2,700	NA	(B)	500	9.7E+7	1.4E+8	2.7E+8	2,500
Acetic acid	12,000	NA	(B)	18,000	4.2E+8	5.9E+8	1.0E+9 (G)	9.0E+5
Acetone	2,100	NA	25,000	100	7.4E+7	1.0E+8	2.1E+8	100
Acetonitrile	400	NA	810	50	1.4E+7	2.0E+7	3.9E+7	100
Acrolein	330	NA	2.5	5	1.2E+7	1.7E+7	3.3E+7	10
Acrylamide	0.78	NA	9.1	0.5	33,000	47,000	1.1E+5	5
Acrylic acid	11,000	NA	(B)	NA	3.9E+8	5.5E+8	1.0E+9 (G)	NA
Acrylonitrile	6.4	NA	2.2	1	46,000	64,000	1.3E+5	10
Alachlor	2 (C)	NA	48	1	1.9E+6	2.6E+6	6.2E+6	20
Aldicarb	3 (C)	NA	(B)	2	4.5E+6	6.3E+6	1.5E+7	50
Aldicarb sulfoxide	4 (C)	NA	(B)	2	5.9E+6	8.2E+6	1.9E+7	50
Aldicarb sulfone	2 (C)	NA	(B)	2	5.0E+6	7.0E+6	1.6E+7	50
Aldrin	0.2	NA	0.0014	0.01	8,800	12,000	29,000	20
Aluminum	ID	50 (A,F)	(B)	100	ID	ID	ID	700
Ammonia	ID (P)	NA	20 (D)	50	ID (P)	ID (P)	ID (P)	1,000
Aniline	610	NA	4	20	2.6E+7	3.7E+7	8.7E+7	1,700
Anthracene	21,000	NA	1.1E+5	5	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	330
Antimony	6 (A,C)	NA	50 (A)	5	1.6E+6	2.2E+6	5.2E+6	500
Arsenic	50 (A,C)	NA	11 (A)	5	83,000	1.2E+5	2.8E+5	100
Atrazine	3 (C)	NA	7.8	1	6.8E+5	9.5E+5	2.3E+6	50
Azobenzene	32	NA	(B)	NA	1.4E+6	1.9E+6	4.5E+6	NA
Barium	2,000 (A,C)	NA	630 (A,D)	200	3.2E+8	4.4E+8	1.0E+9 (G)	1,000
Benzene	5 (C)	NA	53	5	8.5E+5	1.2E+6	2.4E+6	10

Chemical	GROUNDWATER (ppb:ug/l) Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	SOIL (ppb:ug/kg) Direct Contact Value: Industrial	Commercial Subcategory III	Commercial Subcategory IV	Target Method Dete Limit [illegible] Soil
Benzidine	0.015	NA	0.0054	50	650	910	2,200	1,000
Benzo(a)anthracene (Q)	4.8	NA	0.31	5	2.1E+5	2.9E+5	6.8E+5	330
Benzo(b)fluoranthene (Q)	4.8	NA	0.31	5	2.1E+5	2.9E+5	6.8E+5	330
Benzo(k)fluoranthene (Q)	48	NA	0.31	5	2.1E+6	2.9E+6	6.8E+6	330
Benzo(g,h,i)perylene	75	NA	(B)	5	1.6E+7	2.3E+7	5.4E+7	330
Benzo(a)pyrene (Q)	0.2 (C)	NA	0.31	5	21,000	29,000	68,000	330
Benzoic acid	92,000	NA	(B)	50	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	3,300
Benzyl alcohol	29,000	NA	22	50	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	1,300
Benzyl chloride	20	NA	(B)	0.5	1.5E+5	2.0E+5	4.1E+5	200
Beryllium	4 (C)	NA	(B)	1	35,000	49,000	1.2E+5	200
Bis(2-chloroethoxy)ethane	ID	NA	(B)	5	ID	ID	ID	330
bis(2-Chloroethyl)ether	3.2	NA	4.2	5	23,000	32,000	63,000	330
bis(2-Ethylhexyl)phthalate	6 (C)	NA	59	5	1.1E+7	1.5E+7	3.5E+7	330
Boron	1,300 (A)	NA	(B)	300	2.7E+8	3.8E+8	8.9E+8	8,000
Bromobenzene	ID	NA	(B)	1	ID	ID	ID	10
Bromodichloromethane	100 (C,S)	NA	24	1	4.0E+5	5.6E+5	1.1E+6	10
Bromoform	100 (C,S)	NA	65	1	3.1E+6	4.4E+6	8.7E+6	10
Bromomethane	29	NA	11	1	1.0E+6	1.5E+6	2.9E+6	10
n-Butanol	2,700	NA	(B)	800	9.7E+7	1.4E+8	2.7E+8	4,400
2-Butanone (MEK)	38,000	NA	7,200	50	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	100
n-Butyl acetate	1,600	NA	40	10	5.7E+7	7.9E+7	1.6E+8	20
t-Butyl alcohol	11,000	NA	8,300	1,000	4.0E+8	5.6E+8	1.0E+9 (G)	4,400
Butyl benzyl phthalate	3,300	NA	(B)	5	7.2E+8	1.0E+9 (G)	1.0E+9 (G)	330
Cadmium	5 (A,C)	NA	0.64 (A,D)	0.5	2.3E+6	3.2E+6	7.4E+6	50
Camphene	ID	NA	(B)	NA	ID	ID	ID	NA
Caprolactam	17,000	NA	(B)	NA	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	NA
Carbaryl	2,000	NA	(B)	20	4.3E+8	6.1E+8	1.0E+9 (G)	1,000
Carbofuran	40 (C)	NA	1.6	20	3.7E+6	5.2E+6	1.0E+7	200
Carbon disulfide (R)	2,300	NA	(B)	50	8.2E+7	1.1E+8	2.3E+8	100
Carbon tetrachloride	5 (C)	NA	21	1	1.9E+5	2.7E+5	5.3E+5	10
Chlordane	2 (C)	NA	0.00053	0.02	1.2E+5	1.6E+5	3.8E+5	10
Chloride	ID	2.5E+5	(B)	10,000	ID	ID	ID	2.0E+5
Chlorobenzene	100 (C)	NA	71	1	1.4E+7	2.0E+7	3.9E+7	10
Chloroethane	910	NA	(B)	1	6.5E+6	9.1E+6	1.8E+7	10
2-Chloroethyl vinyl ether	ID	NA	(B)	10	ID	ID	ID	100
Chloroform	100 (C,S)	NA	80	1	4.1E+6	5.7E+6	1.1E+7	10
Chloromethane	270	NA	(B)	1	1.9E+6	2.7E+6	5.3E+6	10
4-Chloro-3-methylphenol	420	NA	4.4	5	1.5E+7	2.1E+7	4.1E+7	330
beta-Chloronaphthalene	5,200	NA	(B)	5	1.9E+8	2.6E+8	5.2E+8	330

Chemical	GROUNDWATER (ppb:ug/l) Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	SOIL (ppb:ug/kg) Direct Contact Value: Industrial	Commercial Subcategory III	Commercial Subcategory IV	Target Method Detection Limit in Soil
2-Chlorophenol	130	NA	10	5	4.6E+6	6.5E+6	1.3E+7	330
o-Chlorotoluene	420	NA	{B}	1	1.5E+7	2.1E+7	4.1E+7	10
Chlorpyrifos	63	NA	0.002	0.2	1.4E+7	1.9E+7	4.5E+7	10
Chromium (III) (I)	100 {A,C,J}	NA	77 {A,D}	50	1.0E+9 {G}	1.0E+9 {G}	1.0E+9 {G}	2,500
Chromium (VI) (I)	100 {A,C,J}	NA	7.3 {A}	5	2.2E+7	3.0E+7	7.1E+7	200
Chrysene (Q)	480	NA	0.31	5	2.1E+7	2.9E+7	6.8E+7	330
Cobalt	100	NA	{B}	10	2.3E+7	3.2E+7	7.4E+7	500
Copper	4,000 {A}	1,000	18 {A,D}	25	1.7E+8	2.4E+8	5.6E+8	1,000
Cyanazine	6	NA	4.7	10	2.6E+5	3.6E+5	8.5E+5	500
Cyanide (R)	200 {C}	NA	5.2	20	9.9E+7	1.4E+8	3.3E+8	500
Cyclohexanone	94,000	NA	{B}	50	1.0E+9 {G}	1.0E+9 {G}	1.0E+9 {G}	100
Dacthal	210	NA	{B}	1	4.5E+7	6.3E+7	1.5E+8	20
Dalapon	200 {C}	NA	{B}	10	6.3E+7	8.8E+7	1.8E+8	100
4-4'-DDD	14	NA	0.0084	0.02	6.3E+5	8.8E+5	2.1E+6	20
4-4'-DDE	10	NA	0.0059	0.02	4.4E+5	6.2E+5	1.5E+6	20
4-4'-DDT	10	NA	0.00023	0.02	4.4E+5	6.2E+5	1.5E+6	20
Decabromodiphenyl ether	200	NA	{B}	10	4.5E+7	6.3E+7	1.5E+8	100
Di-n-butyl phthalate	2,500	NA	12,000	5	5.4E+8	7.6E+8	1.0E+9 {G}	330
Di(2-ethylhexyl) adipate	400 {C}	NA	{B}	5	2.1E+7	2.9E+7	5.8E+7	330
Di-n-octyl phthalate	380	NA	{B}	5	8.1E+7	1.1E+8	2.7E+8	330
Diacetone alcohol	ID	NA	{B}	NA	ID	ID	ID	NA
Diazinon	3.8	NA	0.002	0.5	8.1E+5	1.1E+6	2.7E+6	10
Dibenzo(a,h)anthracene (Q)	0.48	NA	0.31	5	21,000	29,000	68,000	330
Dibenzofuran	ID	NA	{B}	5	ID	ID	ID	330
Dibromochloromethane	100 {C,S}	NA	29	1	3.0E+5	4.1E+5	8.2E+5	10
Dibromomethane	230	NA	{B}	5	5.0E+7	6.9E+7	1.6E+8	10
1,2-Dichlorobenzene	600 {C}	NA	7	1	6.4E+7	9.0E+7	1.8E+8	10
1,3-Dichlorobenzene	600 {C}	NA	180	1	6.4E+7	9.0E+7	1.8E+8	10
1,4-Dichlorobenzene	75 {C}	NA	15	1	1.0E+6	1.4E+6	2.9E+6	10
3,3'-Dichlorobenzidine	7.7	NA	0.063	20	55,000	77,000	1.5E+5	2,000
Dichlorodifluoromethane	4,800	NA	{B}	1	1.7E+8	2.4E+8	4.8E+8	10
1,1-Dichloroethane	2,500	NA	{B}	1	8.9E+7	1.3E+8	2.5E+8	10
1,2-Dichloroethane	5 {C}	NA	560	1	2.7E+5	3.8E+5	7.6E+5	10
1,1-Dichloroethylene	7 {C}	NA	32	1	7.4E+5	1.0E+6	2.1E+6	10
cis-1,2-Dichloroethylene	70 {C}	NA	{B}	1	8.2E+6	1.1E+7	2.3E+7	10
trans-1,2-Dichloroethylene	100 {C}	NA	300	1	1.3E+7	1.8E+7	3.5E+7	10
2,6-Dichloro-4-nitroaniline	6,300	NA	{B}	0.01	1.0E+9 {G}	1.0E+9 {G}	1.0E+9 {G}	0.1
2,4-Dichlorophenol	210	NA	34 {D}	5	4.5E+7	6.3E+7	1.5E+8	330
2,4-Dichlorophenoxyacetic acid	70 {C}	NA	47	10	4.5E+7	6.3E+7	1.5E+8	200

GENERIC INDUSTRIAL AND COMMERCIAL CLEANUP CRITERIA

Chemical	GROUNDWATER (ppb:ug/l) Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	SOIL (ppb:ug/kg) Direct Contact Value: Industrial	Commercial Subcategory III	Commercial Subcategory IV	Target Method Detect Limit in Soil
1,2-Dichloropropane	5 (C)	NA	64	1	3.6E+5	5.1E+5	1.0E+6	10
1,3-Dichloropropene (J)	19	NA	3	1	1.4E+5	1.9E+5	3.8E+5	10
Dichlorovos	12	NA	(B)	0.1	5.2E+5	7.2E+5	1.7E+6	50
Dicyclohexyl phthalate	ID	NA	(B)	5	ID	ID	ID	330
Dieldrin	0.22	NA	3.2E-5	0.02	9,400	13,000	31,000	20
Diethoxymethane	ID	NA	(B)	10	ID	ID	ID	100
Diethyl ether	10,000	NA	(B)	50	3.7E+8	5.2E+8	1.0E+9 (G)	100
Diethyl phthalate	16,000	NA	1.2E+5	5	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	330
Diethylene glycol monobutyl ether	250	NA	(B)	NA	5.4E+7	7.6E+7	1.8E+8	NA
Diisopropylamine	16	NA	(B)	NA	5.7E+5	8.0E+5	1.6E+6	NA
Dimethyl phthalate	2.1E+5	NA	2.9E+6	5	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	330
N,N-Dimethylacetamide	520	NA	(B)	NA	1.9E+7	2.6E+7	5.2E+7	NA
N,N-Dimethylaniline	46	NA	(B)	NA	1.6E+6	2.3E+6	4.6E+6	NA
Dimethylformamide	2,000	NA	3,800	NA	7.1E+7	1.0E+8	2.0E+8	NA
2,4-Dimethylphenol	1,000	NA	31	5	2.3E+8	3.2E+8	7.4E+8	330
2,6-Dimethylphenol	13	NA	(B)	5	2.7E+6	3.8E+6	8.9E+6	330
3,4-Dimethylphenol	29	NA	(B)	5	6.3E+6	8.8E+6	2.1E+7	330
Dimethylsulfoxide	6.3E+5	NA	(B)	NA	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	NA
2,4-Dinitrotoluene	5.1	NA	91	5	2.2E+5	3.1E+5	7.3E+5	330
Dinoseb	7 (C)	NA	0.5 (D)	1	4.5E+6	6.3E+6	1.5E+7	20
1,4-Dioxane	320	NA	2,000	1	2.3E+6	3.2E+6	6.3E+6	10
Diquat	20 (C)	NA	(B)	1	9.9E+6	1.4E+7	3.3E+7	NA
Endosulfan (J)	4.8	NA	(B)	0.01	1.0E+6	1.5E+6	3.4E+6	3.3
Endothall	100 (C)	NA	(B)	20	7.7E+7	1.1E+8	2.5E+8	NA
Endrin	2 (C)	NA	0.0023	0.02	7.7E+5	1.1E+6	2.5E+6	20
Epichlorohydrin	350	NA	(B)	5	2.5E+6	3.5E+6	7.0E+6	10
Ethanol	5.6E+6	NA	41,000	1,000	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	4,400
Ethyl acetate	19,000	NA	1,000	NA	6.7E+8	9.4E+8	1.0E+9 (G)	NA
1-Ethyl-2-methylbenzene	ID	NA	(B)	NA	ID	ID	ID	NA
Ethylbenzene	700 (C)	74	31	1	7.2E+7	1.0E+8	2.0E+8	10
Ethylene dibromide	0.05 (C)	NA	1.1	1	290	410	810	10
Ethylene glycol	42,000	NA	68,000	5,000	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	5,000
Ethylene glycol acetate	ID	NA	(B)	NA	ID	ID	ID	NA
Ethylene glycol monobutyl ether	270	NA	(B)	NA	9.7E+6	1.4E+7	2.7E+7	NA
Fluoranthene	2,500	NA	370	5	5.4E+8	7.6E+8	1.0E+9 (G)	330
Fluorene	2,500	NA	14,000	5	5.4E+8	7.6E+8	1.0E+9 (G)	330
Fluorine	400 (C)	2,000	1,900	NA	2.7E+8	3.8E+8	8.9E+8	NA
Formaldehyde	3,800	NA	170	100	1.3E+8	1.9E+8	3.7E+8	500
Formic acid	29,000	NA	(B)	18,000	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	9.0E+5

Chemical	GROUNDWATER (ppb:ug/l)				SOIL (ppb:ug/kg)			
	Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	Direct Contact Value: Industrial	Direct Contact Value: Commercial Subcategory III	Direct Contact Value: Commercial Subcategory IV	Target Method Detection Limit in Soil
1-Formylpiperidine	230	NA	(B)	NA	8.2E+6	1.1E+7	2.3E+7	NA
Gentian violet	35	NA	(B)	NA	1.5E+6	2.1E+6	5.0E+6	NA
Glyphosate	700 (C)	NA	(B)	100	4.5E+8	6.3E+8	1.0E+9 (G)	NA
Heptachlor	0.4 (C)	NA	0.0016	0.01	33,000	47,000	1.1E+5	20
Heptachlor epoxide	0.2 (C)	NA	0.0011	0.01	16,000	23,000	54,000	20
n-Heptane	92,000	NA	4	NA	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	NA
Hexabromobenzene	58	NA	(B)	(K)	1.3E+7	1.8E+7	4.2E+7	(K)
Hexachlorobenzene (C-66)	1(C)	NA	0.0019	(K)	94,000	1.3E+5	3.1E+5	(K)
Hexachlorobutadiene (C-46)	45	NA	500	(K)	1.9E+6	2.7E+6	6.4E+6	(K)
alpha-Hexachlorocyclohexane	0.55	NA	0.13	0.01	24,000	33,000	79,000	20
beta-Hexachlorocyclohexane	1.9	NA	0.46	0.01	83,000	1.2E+5	2.8E+5	20
Hexachlorocyclopentadiene (C-56)	50 (C)	NA	0.54	(K)	3.2E+7	4.5E+7	1.1E+8	(K)
Hexachloroethane	250	NA	13	2	1.8E+6	2.5E+6	4.9E+6	50
n-Hexane	8,600	NA	(B)	NA	3.1E+8	4.3E+8	8.5E+8	NA
2-Hexanone	2,900	NA	(B)	50	1.0E+8	1.5E+8	2.9E+8	100
Indeno(1,2,3-cd)pyrene (Q)	4.8	NA	0.31	5	2.1E+5	2.9E+5	6.8E+5	330
Iron	ID	300 (A)	(B)	100	ID	ID	ID	2,000
Isobutyl alcohol	6,700	NA	(B)	1,000	2.4E+8	3.3E+8	6.6E+8	4,400
Isophorone	3,700	NA	860	5	2.6E+7	3.7E+7	7.3E+7	330
Isopropyl alcohol	1,300	NA	21,000	400	4.8E+7	6.7E+7	1.3E+8	4,400
Lead	4 (A,L)	NA	6.6 (A,D)	3	4.0E+5 (L)	4.0E+5 (L)	4.0E+5 (L)	1,000
Lindane	0.2 (C)	NA	0.08	0.01	1.2E+5	1.6E+5	3.8E+5	20
Magnesium	1.2E+6	NA	(B)	30	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	3,000
Manganese	500 (A)	50 (A)	(B)	20	2.2E+7	3.0E+7	7.1E+7	2,000
Mercury (Inorganic)	2 (A,C)	NA	0.0013 (A)	0.2	1.4E+6	1.9E+6	4.5E+6	100
Methanol	10,000	NA	41,000	1,000	3.7E+8	5.2E+8	1.0E+9 (G)	4,400
Methoxychlor	40 (C)	NA	(B)	0.5	2.3E+7	3.2E+7	7.4E+7	50
2-Methoxyethanol	83	NA	(B)	NA	3.0E+6	4.2E+6	8.3E+6	NA
2-Methyl-4-chlorophenoxyacetic acid	21	NA	(B)	0.5	4.5E+6	6.3E+6	1.5E+7	100
2-Methyl-4,6-dinitrophenol	7.3	NA	0.59	20	1.6E+6	2.2E+6	5.2E+6	1,700
4-Methyl-2-pentanone (MIBK)	1,000	NA	(B)	50	3.7E+7	5.2E+7	1.0E+8	100
Methyl-tert-butyl ether (MTBE)	690	NA	380	50	2.5E+7	3.4E+7	6.8E+7	100
N-Methyl-morpholine	56	NA	(B)	NA	2.0E+6	2.8E+6	5.6E+6	NA
Methylcyclopentane	ID	NA	(B)	50	ID	ID	ID	500
4,4'-Methylene-bis-2-chloroaniline (M)	3.6	NA	(B)	1	1.6E+5	2.2E+5	5.1E+5	50
Methylene chloride	5 (C)	NA	59	5	3.3E+6	4.6E+6	9.2E+6	10
2-Methylnaphthalene	ID	NA	(B)	5	ID	ID	ID	330
2-Methylphenol	1,000	NA	38	5	3.7E+7	5.2E+7	1.0E+8	330
3-Methylphenol	1,000	NA	(B)	5	2.3E+8	3.2E+8	7.4E+8	330

Chemical	GROUNDWATER (ppb:ug/l) Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	SOIL (ppb:ug/kg) Direct Contact Value Industrial	Commercial Subcategory III	Commercial Subcategory IV	Target Metho Detec Limit in Soil
4-Methylphenol	100	NA	6.2	5	2.3E+7	3.2E+7	7.4E+7	330
Metolachlor	670	NA	150	10	2.9E+7	4.0E+7	9.5E+7	50
Molybdenum	100 (A)	NA	800 (A)	10	2.3E+7	3.2E+7	7.4E+7	100
Naphthalene	750	NA	29	5	1.6E+8	2.3E+8	5.4E+8	330
Nickel	100 (A,C)	NA	57 (A,D)	50	3.4E+8	4.8E+8	1.0E+9 (G)	1,000
Nitrate (P)	10,000 (C,P)	NA	(B)	100	ID	ID	ID	NA
Nitrite (P)	1,000 (C,P)	NA	(B)	100	ID	ID	ID	NA
Nitrobenzene	9.6	NA	1,900	5	3.4E+5	4.8E+5	9.5E+5	330
2-Nitrophenol	58	NA	(B)	5	1.3E+7	1.8E+7	4.2E+7	330
n-Nitroso-di-n-propylamine	0.5	NA	(B)	5	3,500	5,000	9,900	330
N-Nitrosodiphenylamine	710	NA	160	5	5.1E+6	7.1E+6	1.4E+7	330
Oxamyl	200 (C)	NA	(B)	NA	1.7E+8	2.4E+8	5.6E+8	NA
Oxo-hexyl acetate	210	NA	(B)	NA	7.4E+6	1.0E+7	2.1E+7	NA
Pendimethalin	2,500	NA	0.62	0.1	5.4E+8	7.6E+8	1.0E+9 (G)	20
Pentachlorobenzene	17	NA	(B)	2	3.7E+6	5.2E+6	1.2E+7	50
Pentachloronitrobenzene	160	NA	(B)	2	3.4E+7	4.7E+7	1.1E+8	50
Pentachlorophenol	1 (C)	NA	0.8 (D)	20	1.3E+6	1.8E+6	4.1E+6	3,400
Pentane	ID	NA	(B)	100	ID	ID	ID	1,000
2-Pentene	ID	NA	(B)	NA	ID	ID	ID	NA
Phenanthrene	75	NA	(B)	5	1.6E+7	2.3E+7	5.4E+7	330
Phenol	13,000	NA	1,100	5	4.5E+8	6.2E+8	1.0E+9 (G)	330
Picloram	500 (C)	NA	(B)	10	3.2E+8	4.4E+8	1.0E+9 (G)	100
Piperidine	9.2	NA	(B)	NA	3.3E+5	4.6E+5	9.1E+5	NA
Polybrominated biphenyls (J)	0.39	NA	(B)	NA	17,000	24,000	56,000	NA
Polychlorinated biphenyls (PCBs) (J,T)	0.5 (C)	NA	2.0E-5	0.2	21,000	30,000	58,000	330
Prometon	460	NA	(B)	0.5	9.9E+7	1.4E+8	3.3E+8	20
Propachlor	270	NA	(B)	1	5.9E+7	8.2E+7	1.9E+8	20
Propazine	560	NA	(B)	0.5	1.2E+8	1.7E+8	4.0E+8	20
Propionic acid	35,000	NA	(B)	100	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	6,700
Propyl alcohol	4,000	NA	15,000	NA	1.4E+8	2.0E+8	3.9E+8	NA
Propylene glycol	4.2E+5	NA	1.9E+5	5,000	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	5,000
Pyrene	1,600	NA	11,000	5	3.4E+8	4.7E+8	1.0E+9 (G)	330
Pyridine	21	NA	20	20	7.4E+5	1.0E+6	2.1E+6	330
Selenium	50 (A,C)	NA	5 (A)	5	2.3E+7	3.2E+7	7.4E+7	500
Silver	98 (A)	100	0.1 (A)	0.5	2.1E+7	3.0E+7	7.0E+7	500
Simazine	4 (C)	NA	3.4	10	2.3E+7	3.3E+7	7.7E+7	40
Sodium	4.5E+5	NA	(B)	NA	1.0E+9 (G)	1.0E+9 (G)	1.0E+9 (G)	NA
Styrene	100 (C)	NA	19	1	8.3E+5	1.2E+6	2.3E+6	10
Sulfate	ID	2.5E+5	(B)	NA	ID	ID	ID	NA

Chemical	GROUNDWATER (ppb:ug/l) Health-Based Drinking Water Value	Aesthetic Drinking Water Value	GSI Value	Target Method Detection Limit in Water	SOIL (ppb:ug/kg) Direct Contact Value: Industrial	Commercial Subcategory III	Commercial Subcategory IV	Target Method Detection Limit in Soil
Tebuthiuron	1,500	NA	{B}	NA	3.2E+8	4.4E+8	1.0E+9 {G}	NA
2,3,7,8-Tetrabromodibenzo-p-dioxin {O}	{O}	NA	{O}	0.0001	{O}	{O}	{O}	0.01
1,2,4,5-Tetrachlorobenzene	7,100	NA	0.4	0.1	1.0E+9 {G}	1.0E+9 {G}	1.0E+9 {G}	20
2,3,7,8-Tetrachlorodibenzo-p-dioxin {O}	3.0E-5 {C}	NA	1.4E-8	1.0E-5	0.99	1.4	2.9	0.001
1,1,1,2-Tetrachloroethane	130	NA	{B}	1	9.5E+5	1.3E+6	2.7E+6	10
1,1,2,2-Tetrachloroethane	17	NA	32	1	1.2E+5	1.7E+5	3.5E+5	10
Tetrachloroethylene	5 {C}	NA	22	1	4.9E+5	6.8E+5	1.4E+6	10
Tetrahydrofuran	690	NA	3,300	1,000	2.5E+7	3.4E+7	6.8E+7	10,000
Thallium	2 {A,C}	NA	5.4 {A}	2	3.0E+5	4.2E+5	1.0E+6	500
Toluene	1,000 {C}	790	110	1	1.6E+8	2.3E+8	4.6E+8	10
p-Toluidine	18	NA	{B}	NA	7.9E+5	1.1E+6	2.6E+6	NA
Toxaphene	3 {C}	NA	0.0002	1	23,000	32,000	63,000	170
Triallate	270	NA	{B}	1	5.9E+7	8.2E+7	1.9E+8	20
Tributylamine	29	NA	{B}	NA	1.0E+6	1.5E+6	2.9E+6	NA
1,2,4-Trichlorobenzene	70 {C}	NA	22	5	6.8E+7	9.5E+7	2.2E+8	330
1,1,1-Trichloroethane	200 {C}	NA	120	1	2.1E+7	2.9E+7	5.8E+7	10
1,1,2-Trichloroethane	5 {C}	NA	65	1	4.4E+5	6.1E+5	1.2E+6	10
Trichloroethylene	5 {C}	NA	94	1	1.6E+6	2.2E+6	4.3E+6	10
Trichlorofluoromethane	7,300	NA	580	1	2.6E+8	3.6E+8	7.3E+8	10
2,4,5-Trichlorophenol	2,100	NA	25	50	4.5E+8	6.3E+8	1.0E+9 {G}	1,700
2,4,6-Trichlorophenol	320	NA	27 {D}	5	1.4E+7	1.9E+7	4.5E+7	330
2(2,4,5-Trichlorophenoxy)propionic acid {N}	50 {C}	NA	21	1	3.4E+7	4.7E+7	1.1E+8	50
1,2,3-Trichloropropane	120	NA	{B}	1	2.6E+7	3.6E+7	8.5E+7	10
1,1,2-Trichloro-1,2,2-trifluoroethane	5.6E+5	NA	33	NA	1.0E+9 {G}	1.0E+9 {G}	1.0E+9 {G}	NA
Triethanolamine	10,000	NA	{B}	NA	3.7E+8	5.2E+8	1.0E+9 {G}	NA
3-Trifluoromethyl-4-nitrophenol	13,000	NA	32 {D}	NA	1.0E+9 {G}	1.0E+9 {G}	1.0E+9 {G}	NA
Trifluralin	450	NA	{B}	1	2.0E+7	2.7E+7	6.4E+7	50
2,2,4-Trimethyl pentane	ID	NA	{B}	50	ID	ID	ID	500
2,2,4-Trimethyl-2-pentene	ID	NA	{B}	NA	ID	ID	ID	NA
1,2,4-Trimethylbenzene	86	NA	22	1	3.1E+6	4.3E+6	8.5E+6	10
1,3,5-Trimethylbenzene	65	NA	26	1	2.3E+6	3.2E+6	6.4E+6	10
tris(2,3-Dibromopropyl)phosphate	1.9	NA	{B}	NA	83,000	1.2E+5	2.8E+5	NA
Urea	ID {P}	NA	{B}	400	ID {P}	ID {P}	ID {P}	20,000
Vanadium	180 {A}	NA	8 {A}	20	3.9E+7	5.5E+7	1.3E+8	1,000
Vinyl acetate	1,800	NA	{B}	50	6.5E+7	9.2E+7	1.8E+8	100
Vinyl chloride	2 {C}	NA	3.1	1	11,000	16,000	31,000	10
White phosphorus {R}	0.31	NA	{B}	NA	68,000.	95,000.	2.2E+5.	NA
Xylenes	10,000 {C}	280	59	3	1.0E+9 {G}	1.0E+9 {G}	1.0E+9 {G}	30
Zinc	6,900 {A}	5,000 {A}	81 {A,D}	20	1.0E+9 {G}	1.0E+9 {G}	1.0E+9 {G}	1,000

Footnotes

{A} Background, as defined in Rule 701(c), may be substituted if higher than the cleanup criteria.

{B} Chemical has either not been evaluated or an inadequate data base precludes the development of a GSI value. Contact an ERD toxicologist for assistance.

{C} State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976 used as the default.

{D} GSI value is pH, temperature, or water hardness dependent. Contact an ERD toxicologist for details.

{E} Chemical, due to its physicochemical properties, is not expected to leach through soils to groundwater under most conditions.

(F) Professional judgment used to determine that 50 ppb of aluminum in drinking water is protective of human health.

{G} Criteria exceeds 100% in soil, hence it is reduced to 100%.

{H} Criteria is based on agricultural impacts (phytotoxicity), not 20X groundwater criterion.

{I} Valence-specific chromium data (Cr III and Cr VI) must be compared to the same valence-specific cleanup criteria. If analytical data are provided for "total" chromium only, then values for chromium VI must be applied to the cleanup criteria. Chromium III cleanup criteria can only be used at sites where groundwater is prevented from being used as a public water supply, currently or in the future.

{J} Chemical may be present in several isomer forms. Isomer specific concentrations must be combined for comparison to criteria. Contact an ERD toxicologist for further explanation.

{K} Two different analytical methods and target method detection limits are available for this chemical. Refer to Operational Memorandum #6 for details.

{L} Criteria developed using the U.S. EPA Integrated Uptake Biokinetic Model for children. No risk assessment method(s) is currently available to evaluate lead toxicity in adults. Higher level may be acceptable if soil concentration is less than 400 ppm and groundwater migrating off-site will not impact adjacent properties. Contact an ERD toxicologist for further explanation.

{M} Also known as MBOCA.

{N} Also known as Silvex.

{O} Use 2,3,7,8-TCDD "toxicity equivalence factors" (TEFs) for other chlorinated and /or brominated dibenzo-p-dioxins and chlorinated and/or brominated dibenzofurans for comparison to cleanup criteria. Contact an ERD toxicologist for details.

{P} All potential sources of nitrogen-nitrate must be combined and compared to nitrate criteria. Contact an ERD toxicologist for details.

{Q} Criteria for carcinogenic polynuclear aromatic hydrocarbons (PAHs) were developed using "relative potential potencies" (RPPs) to benzo(a)pyrene.

{R} Chemical may be reactive in soil.

{S} Concentrations of trihalomethanes in groundwater must be combined to determine compliance with the health-based drinking water value of 100 ppb.

{T} Toxic Substances Control Act, Subpart G - PCB Spill Cleanup Policy standards may be more restrictive.

ID = Inadequate data to develop criterion; NA = Not available.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

September 30, 1993

TO: Environmental Response Division Staff

FROM: Alan J. Howard, Chief, Environmental Response Division

SUBJECT: MERA Operational Memorandum #15: Default Type A Cleanup Criteria

In order to facilitate cleanup decisions at sites at which naturally occurring metals may be of concern, the following acceptable default Type A soil cleanup criteria have been established. These values are based on analysis of the database for the Michigan Background Soil Survey (April 1991) which is maintained by Waste Management Division (WMD). They represent the mean plus one standard deviation for WMD data from combined clay, topsoil and sand categories. The values are presented in two significant figures. Data should be rounded to two significant figures for comparison.

Table 1: ACCEPTABLE DEFAULT VALUES
TYPE A SOIL CLEANUP CRITERIA

?m TypeB		Substance	Acceptable Concentration (mg/kg)
1.0		Aluminum	6900
	C	Arsenic	5.8
48,	C	Barium	75
0.07,	C	Cadmium	1.2
	—	Cobalt	6.8
2.4	C	Chromium (total)	18
20	C	Copper	32
3.0	C	Cyanide	0.39

Substance	Acceptable Concentration (mg/kg)	Ty	
Iron	12000	6.0	C
Mercury	0.13	0.042	C
Lithium	9.8	—	
Manganese	440	1.0	C
Nickel	20	11.0	C
Lead	21	C	
Selenium	0.41	0.7	C
Silver	1.0	0.66	C
Zinc	47	46	C

The default values apply as follows:

1. If measured concentrations at a site do not exceed the values listed in Table 1, site specific samples to establish background are not required.

2. The values apply to all soil types, statewide.

3. It is acceptable to establish a site-specific background concentration higher than the default values. Such sampling should be conducted according to requirements in existence before the issuance of this memorandum. Comparison of site values is made against the mean plus three standard deviations calculated from background samples as provided for in existing ERD guidance regarding verification of soil remediation.

4. Staff also may approve Type A cleanups based on a regionally proximate background value higher than the default values. Comparison should be made as in #3, above.

This memorandum is intended to provide guidance to Division staff to foster consistent application of the Michigan Environmental Response Act (1982 PA 307, as amended) and the Administrative Rules promulgated thereunder. This document is not intended to convey any rights to any parties nor create any duties or responsibilities under law. This document and matters addressed herein are subject to revision.

Any questions about this memorandum should be directed to Bill Iversen at 517-373-0907.

rev. 0

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